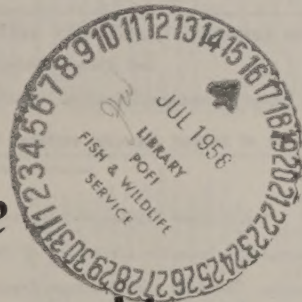


Commercial Fisheries Abstracts

a monthly summary of important developments
for the fishery industries

In this issue ~

- Knotless Nets P. 3
- Salt - Water Ice P. 7
- Freezing Lobster Meat P. 9
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~ and 35 others

Vol. 11 No. 6

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Commercial Fisheries Abstracts



*Prepared in the Division of Industrial Research and Services
Bureau of Commercial Fisheries*

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Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

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|---------------------------|----------------------|----------------------|
| 0 General and theoretical | 3 Preserved fish | 7 Analytical Methods |
| 1 Fish by species | 4 Oils | 8 Composition |
| 2 Fresh fish | 5 Vitamins | 9 Miscellaneous |
| | 6 Fishery byproducts | |

Anonymous

Report of the Food Investigation Board (Great Britain) for 1956, pp. 23-25 (1957)

Fish muscle proteins.-- Knowledge of the nature and condition of fish proteins is far from complete. Electrophoretic examination has revealed a new protein or group of proteins in the expressible fluid of cod muscle. This protein may be a component of the muscle fibrils. The expressible fluid of cod frozen at different rates of speed varies in its content of the new protein. These variations resemble the variations found in the amount of deoxyribose nucleic acid present in the expressible fluid. Deoxyribose nucleic acid has been reported to be an index of cell damage.

Lipids.-- During the first 12 to 14 days that cod are stored in ice, enzymic hydrolysis of their lipids is slow and produces very little free fatty acid. Thereafter, a rather sudden breakdown of certain phospholipids occurs; and the rate of production of free fatty acid increases.

Fat oxidation.-- The components that arise during the chemical oxidation of hydroxy linoleic acid obtained from the reduction of purified peroxide have not been identified. Some of the hydroxy linoleic acids in the reduced peroxide can be dehydrated to yield a conjugated linoleic acid.

Extractives of fish muscle.-- Storage, death, and dehydration of fish cause changes in the flavor, color, and appearance of fish. These changes are due to changes in the "extractives" that may be present in fish. These changes can be brought about by the action of bacteria. Bacteria produce, on wise sterile fish muscle, changes in the color, odor, and taste of the fish. Bacteria produce, on incubation at 32° F., large quantities of glycine, alanine, glutamic acid, aspartic acid, lysine, valine, and leucine. Some species of bacteria even removed the β -alanine liberated by the muscle enzyme

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COMMERCIAL FISHERIES ABSTRACTS VOL. XI, NO. 6 PAGE 1
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: Martin Heerdt

BACTERIOLOGY: MARINE BACTERIA ARE THE MAIN AGENTS IN THE SPOILAGE OF FISH

Anonymous

Report of the Food Investigation Board (Great Britain) for 1956, pp. 20-22 (1957)

Flora of cod and the effects of handling.-- Washing fish before filleting by directing a stream of water on them at the filleting bench is an inefficient practice. This treatment frequently increases the bacterial contamination of the fish at the bottom of the pile. Bacterial contamination on the skin of fish can, however, be reduced by as much as 96 percent with careful washing. The two most important sources of fish contamination are (1) bacteria ranging in number from 10⁴ to 10⁵ per square centimeter on the skin and surface of commercial fillets and (2) bacteria ranging in number from 10⁵ to 10⁶ per square centimeter on filleting benches and knives. Continuously circulating water used to carry fillets in troughs was found to contain about 10⁵ bacteria per milliliter, whereas water not continuously circulated was found to contain about 10⁷ bacteria per milliliter. Heavy bacterial contamination of the water in the trough occurs immediately after the fish are put into it. Experiments in commercial plants showed that fillets placed in a trough without continuously running water were subject to an 80 percent reduction in the surface bacteria count; whereas fillets placed in a trough with continuously running water were subject to a 90 percent reduction in surface bacteria. Most of the bacteria isolated from commercial fillets and filleting benches were found to be marine organisms that were brought in on the fish.

Flora of iced fish during spoilage.-- Newly caught codlings contained about equal number of *Achromobacter* and *Pseudomonas*. These two species made up 90 percent of the flora. The remaining 10 percent consisted of *Flavobacteria*, *Corynebacteria*, and miscellaneous gram-negative rods. During spoilage the number of *Achromobacter* spp. declined, whereas the number of *Pseudomonas*

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COMMERCIAL FISHERIES ABSTRACTS VOL. XI, NO. 6 PAGE 1
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: Martin Heerdt

PROTEINS, LIPIDS, AND NUCLEIC EXTRACTIVES

SPOILAGE BY MARINE BACTERIA

Kask, J. L. (Fisheries Research Board of Canada)

Annual Report of the Fisheries Research Board of Canada 1956-1957 for the Fiscal Year Ending March 31, 1957, pp. 12-14 (1957) (Ottawa)

Technological research and services relating mainly to marine fisheries products are conducted by technological stations in Halifax, Nova Scotia, Grande-Riviere, Quebec, and Vancouver, British Columbia. A technological unit in St. John's, Newfoundland deals particularly with technical and engineering aspects of salt cod processing. Early in 1957 a technological unit was established in London, Ontario for centralization of corresponding studies relating to fresh-water fisheries products.

At the Halifax Station research on maintenance of quality in fresh and frozen fish products continued. Studies of what effects seasonal changes, geographical distribution, and differences in vessels and their management have on quality of landed fish added much to the knowledge of factors contributing to spoilage of fish in fishing boats at sea. Classification of the odors produced by sea for identifying some types of such bacteria in the water and the benefits of antibiotics for delaying the onset of spoilage by such bacteria in Atlantic coast fish results similar to those obtained in earlier work of the Station on Pacific coast fish. Further experiments on allowing refrigeration temperatures to rise temporarily during transportation of frozen fish confirmed previous observations that such rises accelerate subsequent deleterious changes in quality of the product. Advances were made in determining the molecular architecture of the structural and other proteins of fish muscle, and in separating and identifying the various fatty acid units that individualize different fish oils. Several chemical tests of value in assessing fish freshness were standardized for routine fish

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Reprinted in part

Kask, J. L. (Fisheries Research Board of Canada)

Annual Report of the Fisheries Research Board of Canada, 1956-1957 for the Fiscal Year Ending March 31, 1957, pp. 12-14 (1957) (Ottawa)

(Continued from Card 0. 6A)
of tanks containing sea water refrigerated to about 30° F., with or without an added antibiotic, was described in several previous Annual Reports as having certain advantages over ice for holding fish. Experiments with such tanks installed on a commercial fish-packing vessel continued to demonstrate these advantages with fish, and a large commercial shipment of live crabs was successfully held for over 5 days under modified conditions in a tank on this vessel. Six tanks were installed during construction of a large commercial fishing vessel, which landed salmon and halibut in excellent condition up to 7 and 15 days after catching, with good maintenance of quality during an experimental further holding for 1 and 2 weeks. Improved designs of refrigerating equipment for such tanks were worked out and tested, and commercial installations are now offered by several firms to meet the increasing interest on the Pacific coast in this system for holding fishery catches. The effect on color and curd formation in the flesh when salmon so held are canned was examined, and considerable progress was made in devising color measurement procedures for prediction from the color of raw salmon flesh what the probable color after canning will be. Ascorbic acid was confirmed as the best inhibitor of oxidative rancidity in fats of frozen fish, and feeding tests with young poultry were instituted in further trials of antioxidants to protect the oil in stored herring meal. The pilot plant designed for research on condensed fish solubles was completed and tested in an investigation of herring solubles as produced by modified procedures from the stickwater recovered during the manufacture of herring meal. Poultry feeding tests are also in progress for assessing the relative nutritive values of these herring solubles. A thorough study was made of the enzyme actions

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ANNUAL REPORT CANADA (CARD 1)

ANNUAL REPORT CANADA (CARD 2)

0, 5

increased. By the fourteenth day the flora on codlings consisted of 90 percent *Pseudomonas* spp. and 5 percent *Achromobacter* spp. *Flavobacteria* showed a transient increase during the first 12 days and declined rapidly thereafter. This decline corresponded with changes in the chemical and organoleptic aspects of spoilage.

The pattern of change in the bacterial flora of codlings stored in antibiotic ice is not the same as the pattern of change in these fish stored in ordinary ice. If antibiotic ice is used, the early stages of spoilage up to the eighth day show a very heterogeneous flora with the predominant groups being the gut-group *Vibrios* and the yeasts, *Pseudomonas* spp. and *Achromobacter* spp. make up less than 25 percent of this flora. After the 8th day, the *Pseudomonas* group became predominant; and by the 16th day the normal type of spoilage had become established. The number of spoilage organisms, however, remained low; and yeasts and gut-type *Vibrios* disappeared. Antibiotics, therefore, appear to delay the establishment of a typical spoilage flora.

The majority of distant-water cod landed at Hull have had skin counts in the range 4×10^5 to 4×10^6 per square centimeter, and flesh counts in the range 6×10^4 to 6×10^6 per gram. These counts were made on sea-water Lenco agar at 68° F. A number of inquiries have been received about "stinkers" or fish that appear to be quite fresh but still have an undesirable odor throughout the flesh. Slinkers were produced experimentally when fish were tied against dirty, wooden pound-boards and held in ice for about 6 days. Clean aluminum or wooden pound-boards prevented the occurrence of stinkers. Marked differences have been found in the rates of growth of different types of fish-spoilage bacteria at the temperatures of melting ice and in the presence of various concentrations of salt.

0, 35 (Cross Reference: 0, 33)

aminase. Autolytic enzyme systems in the muscle brought about marked changes in the extractions before the onset of bacterial spoilage.

The free nucleotides of fish muscle are currently being studied to learn how they are broken down after death and to learn their relation to known changes in the free sugars. Individual nucleotides have been separated quantitatively. A small residue of adenosine triphosphate was found to remain over a period of 9 days, whereas most of the adenosine triphosphate was dephosphorylated and excreted in the first 24 hours. During this five day period, adenosine diphosphate and di-phosphonate had been released; whereas adenosine monophosphate remained at a constant level. Inosinic acid rose rapidly during the first two days and then disappeared almost as rapidly. During the first 10 days of storage in ice, most of the solid material from cod muscle in quantities of 150 milligrams per 100 grams of molten NaCl solution degraded to a negligible amount. Browning discoloration reactions. -- Sugar-amine reactions are not the only factors in the development of brown discoloration in dehydrated codling muscle. To confirm this suspicion, 1-methyl-histidine, which is liberated in fish muscle by asnerinase after death, was added to dialysed (extractions free) homogenates. These homogenates then were lyophilized. The resulting preparation rapidly became brown both in the light and in the dark under conditions of elevated humidity and temperature. Controls that did not receive 1-methyl-histidine remained colorless.

Phenolic compounds of biological importance. -- The synthesis of a number of heretofore undescribed compounds was involved in a systematic study of the antioxidant activity of the polyhydroxy-flavones. Certain hydroxyflavones were found to be extremely powerful antioxidants. This property was shown to be due to the presence of (1) a hydroxyl group in the 3 position and (2) *o*- or *p*-quinol structures in the nucleus or 2-phenyl group. These antioxidants probably are too sparingly soluble in fats to serve as useful antioxidants for foodstuffs; however, certain more soluble *o*- and *c*-alkyl derivatives are being prepared. A patent application has been filed to cover derivatives or 3:2':5'-trihydroxy- and 3:7:8:2':5'-pentahydroxy-flavone.

0, 6B (Cross Reference: 9, 4)

responsible for liberating certain constituents present in only minor amounts in fish flesh, but which sometimes adversely affect the processing of some products. Because the more that can be learned about the life processes of fish-spoiling organisms the greater is the likelihood of discovering even better methods of protecting fish against spoilage, research on the essential life-covering requirements of several marine bacteria was pursued with vigor. Among these requirements are sodium and potassium compounds, the variable relative amounts of which in fish flesh were also investigated from several other important standpoints including effect of holding fish in refrigerated sea water, and amounts of sodium as salt in dietetic packs of canned salmon. Studies of the nature of phosphorus compounds in salmon liver and of sterols in the fatty material of several marine invertebrates continued; two probably new sterols were isolated. Testing of various synthetic fibers used in fishing nets and gear, and making available advice on specifications for such materials and their care, continued to be an active phase of the Station's programs.

0, 6A (Cross Reference: 9, 4)

inspection work. A procedure for converting fish viscera into a nutritious dried meal suitable for animal feed and possibly in food for man, was developed to a pilot-plant stage with estimation of production costs; extraction of useful secondary products from artificially digested viscera was also explored. Large experimental batches of the practically white, odorless and tasteless "fish flour" were made from edible fish offal for use with wheat flour in bread. Industry appreciation of results of the Station's engineering research on design and materials for holding pens in fishing vessels and on equipment and procedures for processing fish continued to increase.

The Technological Station at Grade-Riviere on the Gaspe coast furthered its researches on causes of the changes that occur in fatty constituents during the preparation of salt fish, on conditions that deter the growth of the two principal kinds of bacteria that cause reddening in salt fish, and on electrical means of determining the salt content of this product. A codfish-salt paste dried in molds aroused interest as a possible new type of salt fish comestible. Initial experiments on substituting a continuous brine salting procedure for the usual dry salting process used in making "Gaspé cure" cod showed promise, and the preservative effect of a dip in an antibiotic solution at a certain stage of the Gaspé cure was demonstrated. Additional studies were made of the mechanism of acid digestion of cod proteins to yield useful secondary products, and of natural enzymic digestion of whole herring to yield oil and spray-dried meat. Engineering work included study of problems relating to storage and artificial drying of salt fish and to smoking of herring.

On the Pacific Coast, the Vancouver Technological Station followed up its researches on recognized antibiotics as fish preservatives, successfully but not completely, that caused application of two of these, Aureomycin and Terramycin, is allowed under the Canadian Pure Food and Drug Regulations for use with fresh fishery products to delay bacterial spoilage. This involved many further experiments on the applications of these antibiotics in ice, in refrigerated sea water as mentioned below, and in solutions for dipping fillets. Further experiments on the injection of Aureomycin into just-harpooned whales demonstrated that this antibiotic offers considerable promise for retarding the severe bacterial decomposition that sometimes occurs in whale-carcaasses before they can be processed. Use (Continued on Card 0, 6B)

ALTERATIONS IN THE BLOOD LEVEL OF LACTIC ACID IN CERTAIN SALMONOID FISHES FOLLOWING MUSCULAR ACTIVITY. III. SOCKEYE SALMON (*ONCORHYNCHUS NERKA*)

Black, Edgar C. (University of British Columbia, Vancouver, B. C., Canada)
Journal of the Fisheries Research Board of Canada **14**, 807-814 (November 1957)

Introduction. -- Alterations in the blood level of lactic acid after severe muscular activity previously have been reported by the author for Kamloops trout (*Salmo gairdneri*) and lake trout (*Salvelinus namaycush*). In both of these species, the blood level of lactic acid increased sevenfold to tenfold immediately after exercise, continued to increase for 2 hours thereafter, and subsided within 4 to 8 hours after exercise. Phillips et al. (1957) showed that the protein, fat, and water content of hatchery-raised brook trout (*Salvelinus fontinalis*) differed significantly from the protein, fat, and water composition of wild trout. Waters (1944) found that the composition of the diet is important in the survival of trout. In the following study, the condition of captivity and the nature of the diet may have influenced the results described below.

Experimental. -- Two lots of sockeye salmon (*Oncorhynchus nerka*) fingerlings and one lot of two-year-old sockeye salmon which had been reared in an experimental laboratory at Nanaimo, were used in a further study of the blood level of lactic acid at the Institute of Fisheries, University of British Columbia. The fingerlings in lot 1 were exercised continuously for 15 minutes in a long trough containing fresh water, whereas the fingerlings in lot 2 were exercised continuously for 15 minutes in a long trough containing sea water with a salinity of 26.7 grams per kilogram, a pH of 7.1, and a temperature of 8° to 12°C. After exercise, the fingerlings in lots 1 and 2 were allowed to recover respectively, in fresh water and in sea water at the Nanaimo laboratory, during which time blood samples were taken and analyzed for hemoglobin. Aliquots of these blood samples were removed for protein precipitation. The 2-year-olds were exercised in a circular tank of sea water at

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COMMERCIAL FISHERIES ABSTRACTS VOL. XI, NO. 6 PAGE 3
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: Martin Heerd

2. 111 SYNTHETIC FIBERS MAKE KNOTLESS NETS POSSIBLE

Anonymous
Western Fisheries **55**, 11, 40 (February 1958)

Until several years ago, almost all fishing nets were made of natural fibers. Although invented in Japan in 1922, the knotless net became feasible only after rot-proof synthetic fibers were introduced into the fishnet industry. The use of knotless nets in Japan is increasing, and it is believed these nets may replace ordinary nets in the near future.

Some of the special features of knotless nets are: (1) lighter weight and less bulk, (2) higher strength, (3) less resistance to currents, (4) greater ease of handling and no friction, (5) less labor and smaller lacks feasible, (6) no damage to the fish, (7) more exact mesh size, (8) easier and more complete dyeing, and (9) less adherence of dirt and microbes.

The torn parts of knotless nets are mended as easily as are those of the knotted nets. The only difference is the threading from one mesh is started outside and the ends of the torn thread are bent inside.

The knotless nets are manufactured as follows: First, the preparing process includes doubling, in which several single yarns are doubled together without twist by a doubling machine. Next, the "first twist" is carried out. Two or more of these doubled yarns are again doubled and are twisted into a strand in Z-direction in one operation. Then this strand is wound on the bobbins of the netting machine.

The netting process consists of the following: Two bobbins are attached to both sides of the

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COMMERCIAL FISHERIES ABSTRACTS VOL. XI, NO. 6 PAGE 3
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: June H. Olden

LACTIC ACID IN EXERCISED SALMON

KNOTLESS NETS

TUNISIAN GOVERNMENT PLAN TO INCREASE FISH CATCH AND SAVE £ 1000 A NIGHT

Anonymous
FAO News Release, Fisheries Division, FAO, Rome (February 17, 1958)

A plan to equip the Tunisian sardine fishing fleet with underwater lights for night fishing, which is expected to make a substantial increase in fish catch and will ultimately save the fishermen about £ 1000 a night, is shortly to be put into operation by the Government of Tunisia, according to F. L. Bourgois, FAO Representative in Tunisia and Fishery Planning Adviser to the Tunisian Government.

"The plan for this year is to equip about one-third of the sardine fishing fleet with underwater lamps," stated Mr. Bourgois in an interview at the Rome headquarters of the Food and Agriculture Organization (FAO). "The Government will provide 30 or 40 boats with diesel generators and about 80 boats with the new type of underwater lamps. Next year, according to the plan, the rest of the fleet will be similarly equipped."

This development follows the experimental work carried out by Mr. Bourgois and Capt. L. Farine, a FAO master fisherman, who have been on assignment in Tunisia.

"We found that the Tunisian fishermen were using above-water lamps in their night fishing for sardines, sardinella and similar pelagic species," explained Mr. Bourgois. "Naturally, lights shining above water lose a lot of their effectiveness in attracting fish as the light rays are dispersed. We carried out experimental night fishing with one boat equipped with underwater lamps and we caught as many fish with the boat as the Tunisian fishermen had been catching with the same type of boat equipped with ordinary lamps eight times more powerful."

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COMMERCIAL FISHERIES ABSTRACTS VOL. XI, NO. 6 PAGE 5
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

Reprinted in part

2. 6 MARKETING CONDITIONS

Anonymous
Report of the Food Investigation Board (Great Britain) for 1956, pp. 9-10 (1957)

The temperatures of about 7,000 fish were measured at fish markets and at fish dealers' premises located at Hull and at Grimsby in England. At these markets and at other nearby markets, distant water fish had initial temperatures ranging from 30° to 32° F. No significant differences in temperature were found between bulk fish and shelf-stored fish. Temperature readings of 30° F. were more commonly found in a similar survey conducted at Grimsby in 1950 to 1951.

Fish are allowed to stand on the market for 6 to 8 hours after they are unloaded and before they are sold. At Hull, up to 15 percent of the fish remained unfilleted and uniced for as long as 8 hours after the selling of fish began. Fish at the surface of market containers or stacks of containers rose more rapidly in temperature than did fish in the center of a container or stack. At times a considerable variation existed in the fish temperatures regionally, and in the range of temperature within a container. At 65° F. air temperature, fish temperatures regionally could be expected to fall within the range 32° to 52° F. within 6 hours after they had been unloaded and in the range 36° to 60° F. within 12 hours. At Grimsby, where rectangular containers are stacked 4 to 5 containers high, the fish in different layers varied by as much as 9° to 4° F. At Hull, where deep tube-shaped containers were used, the average temperature of fish before they were filleted was 42.7° F. At Grimsby, the average temperature of the fish held in bulk was 39.5° F., and the average temperature of fish held on shelves was 43.4° F.

At both Hull and Grimsby, fillets that had been cut from the fish and washed in 50° F. water rose 4.5° to 8.5° F. and had temperatures of about 48° to 49° F. immediately before they were packed in

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COMMERCIAL FISHERIES ABSTRACTS VOL. XI, NO. 6 PAGE 5
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: Martin Heerd

UNDERWATER LIGHTS FOR FISHING

MARKET AND TRANSIT TEMPERATURES

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special flat spindle, and by turns of the spindle, a second twisting operation inserts a twist in an "S" direction into the twine. When the necessary number of twists is made, these two bobbins move and exchange their places with two neighboring bobbins, and the point of intersection of twine, which corresponds to a "knot" in the knotted net, is made accordingly.

Strands of both twines run across through each other, being twisted in opposite directions, and a "knot" is made. The twine in the knottless net has an "S" twist of 2-ply strands. After the nets are inspected and flaws or irregular twists are repaired, the top and bottom selvages are woven. Any particular type of net can be made to order.

Except for cotton, Kuralon, and the other spun yarns, the heat setting process is necessary for the nets of filament yarns such as Nylon, Krehalon, and Saran, and Tevlon and Kuralon No. 5. By this operation, the twist of the strands are fixed in position, and the strength of the twine becomes higher by about 15 percent. Moreover, hard fibers become soft, and on the other hand, soft fibers are given suitable hardness.

Except for the materials such as Krehalon and Saran, the nets of nylon, Kuralon or Tevlon fibers are dyed with the commercial dyesuffs, pigment colors, or coal tar. Heat setting is generally not required in this process.

2, 02

12° C. and handled in a manner similar to that used with the fingerlings.

Results with fingerlings. --The blood level of lactic acid in fresh-water fingerlings at rest was 16.9 ± 2.2 mg. percent. These fingerlings had a blood level of 112 ± 4.8 milligrams (mg.) percent lactic acid after 15 minutes of exercise in fresh water and 211 ± 13.2 mg. percent lactic acid after 2 hours of recovery from the exercise in fresh water. The changes indicated are similar to those reported for Kamloops and lake trout. Fingerlings that had been acclimated for 2 days in sea water had a blood level of 24.1 ± 3.32 mg. percent lactic acid at rest, and a blood level of 167 ± 9.4 mg. percent lactic acid after 15 minutes of vigorous activity in sea water, and a blood level of 117 ± 30.6 mg. percent lactic acid after 2 hours of recovery from exercise in sea water. Correlated changes in behavior indicate that sea water appeared to be of immediate benefit to fingerlings in coping with the metabolites of muscular exercise.

Results with two-year-olds. --Two-year-olds that had spent $1\frac{1}{2}$ years in sea water had a blood level of 19.5 ± 24.4 mg. percent lactic acid at rest. After 15 minutes of severe exercise in sea water, the 2-year-olds had a blood level of 103 ± 6.3 mg. percent lactic acid that increased still further, to 172 mg. percent lactic acid during the first hour of recovery in sea water and did not decline to the resting level until the sixth hour of recovery in sea water. These changes are similar to those reported for Kamloops and lake trout. During the recovery period, 5 out of 19 2-year-olds died between the first and second hour of recovery. The average blood level of lactic acid in the 2-year-olds that died was 240 ± 14.9 mg. percent. The benefit of sea water to the 2-year-olds after exercise appears to have been lost because they were more susceptible to death after exercise than were fingerlings exercised in fresh water. No significant changes occurred in the hemoglobin level of the blood of either fingerlings or 2-year-olds after exercise and recovery.

0, 6B (Cross Reference: 9, 4)

responsible for liberating certain constituents present in only minor amounts in fish flesh, but which sometimes adversely affect the processing of some products. Because the more that can be learned about the life processes of fish-spoiling organisms the greater is the likelihood of discovering even better methods of protecting fish against spoilage, research on the essential life-process requirements of several marine bacteria was pursued with vigor. Among these requirements are sodium and potassium compounds, the variable relative amounts of which in fish flesh were also investigated from several other important standpoints including effect of holding fish in refrigerated sea water, and amounts of sodium as salt in dietetic picks of the fish material. Studies of the nature of phosphorus compounds in salmon livers and of steroids in the fatty material of several marine invertebrates continued, two probably new steroids were isolated. Testing of various synthetic fibers used in fishing nets and gear, and making available a device on specifications for such materials and their care, continued to be an active phase of the Station's programs.

0, 6A (Cross Reference: 9, 4)

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REFRIGERATED SEA WATER SUCCESSFUL WITH HALIBUT

Anonymous
Trade News 10, 6-7 (January 1958)

Since the long holding time of halibut--required because of the length of a trip--indicated some improvement should be made in holding methods, the Fisheries Research Board of Canada decided to direct a test on the application of refrigerated sea water to halibut fishing.

The Silver Viking--a combination salmon seiner and halibut longliner of wood construction, 78 feet long, with a 22-foot beam--was selected for the experiment. Six tanks were installed in the hold, three on either side of the shaft. The tanks were constructed of 3/16-inch steel plate, and surfaces unsupported by the lining of the hold were stiffened by 2 1/2-inch angle irons toe-welded at two-foot centers. The inside surfaces were coated with an Epoxy resin coating to resist corrosion, and 2 inches of cork insulation was applied to the external surfaces.

Cooling coils were contained in closed compartments along the sides of the inboard tank. Circulation of the chilled sea water was provided through these compartments by a separate circulating pump for each tank. Refrigeration to these coils was supplied by two compressors, one for the three port tanks and one for the three starboard tanks.

To augment this refrigeration system was a completely separate one comprising a shell and tube chiller, circulating pump, and refrigerant compressor. Although this system primarily was used to speed up the initial cooling of any one tank, it also served as a stand-by system in event of failure of the tank coil system. All pumps and compressors were electrically driven. Power was supplied by two diesel-driven alternating-current generators of the 120-208-volt type. The chiller was designed with a close tube spacing, permitting high water velocity and hence a high heat transfer from the tubes.

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ABSTRACTER: June H. Olden

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FREEZING WHITE FISH AT SEA

Anonymous

Report of the Food Investigation Board (Great Britain) for 1956, pp. 12-15 (1957)

Introduction.--Recent efforts concerned with freezing and cold storage have been devoted to developing means for freezing the early part of the fish catch obtained by Arctic trawlers. These fish must be frozen whole because of limitation of space and time on board conventional trawlers. On arrival in port, however, the fish can be thawed and handled by existing marketing organizations. Whole frozen cod, therefore, are especially suitable for frozen storage and for overseas supply.

An alternative to freezing aboard the fishing trawler is freezing aboard factory ships. Over-supply of the size and initial expense of large trawlers, however, it is unlikely that very many will be added to the fleet in the immediate future. The staff at Torrey Research Station recently supervised the installation of the J. and E. Hall vertical plate freezer, which was developed at Torrey, aboard a Grimsby trawler, the Northern Wave. This vessel is equipped with a -20° F. refrigerated hold. Storage temperatures are critical for fish that are to be thawed and handled as fresh fish.

Experimental.--Eight voyages now have been completed. No difficulty was encountered in operating the plant or in working in the low-temperature storage room. The first 25 percent of the catch, which was obtained during the first 2 1/2 days of fishing, was frozen. This usually represented 40 tons of whole fish and about 33 tons of headless frozen cod per trip.

The refrigeration machinery aboard the Northern Wave is located forward where it is exposed to severe slamming and vertical acceleration that approaches 1.0 times gravity. No serious difficulties were encountered in the operation of this plant. The plant could not be maintained on a fully commercial basis, however, because the refrigeration machinery could not be operated automatically and was

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ABSTRACTER: Martin Heerd

REFRIGERATED SEA WATER

WHITE FISH FROZEN AT SEA

UNDERWATER LIGHTS FOR FISHING

MARKET AND TRANSIT TEMPERATURES

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TUNISIAN GOVERNMENT PLAN TO INCREASE FISH CATCH AND SAVE £ 1000 A NIGHT

Anonymous
FAO News Release, Fisheries Division, FAO, Rome (February 17, 1958)

A plan to equip the Tunisian sardine fishing fleet with underwater lights for night fishing, which is expected to make a substantial increase in fish catch and will ultimately save the fishermen about £ 1000 a night, is shortly to be put into operation by the Government of Tunisia, according to F. L. Bourgois, FAO Representative in Tunisia and Fishery Planning Advisor to the Tunisian Government.

"The plan for this year is to equip about one-third of the sardine fishing fleet with underwater lamps," stated Mr. Bourgois in an interview at the Rome headquarters of the Food and Agriculture Organization (FAO). "The Government will provide 30 or 40 boats with diesel generators and about 60 boats with the new type of underwater lamps. Next year, according to the plan, the rest of the fleet will be similarly equipped."

This development follows the experimental work carried out by Mr. Bourgois and Capt. L. Favine, a FAO master fisherman, who have been on assignment in Tunisia.

"We found that the Tunisian fishermen were using above-water lamps in their night fishing for sardines, sardinella and similar pelagic species," explained Mr. Bourgois. "Naturally, lights shining above water lose a lot of their effectiveness in attracting fish as the light rays are dispersed. We carried out experimental night fishing with one boat equipped with underwater lamps and we caught as many fish with the boat as the Tunisian fishermen had been catching with the same type of boat equipped with ordinary lamps eight times more powerful."

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MARKETING CONDITIONS

Anonymous

Report of the Food Investigation Board (Great Britain) for 1956, pp. 9-10 (1957)

The temperatures of about 7,000 fish were measured at fish markets and at fish dealers' premises located at Hull and at Grimsby in England. At these markets and at other nearby markets, distant water fish had initial temperatures ranging from 30° to 32° F. No significant differences in temperature were found between bulk fish and shell-stored fish. Temperature readings of 30° F. were more commonly found in a similar survey conducted at Grimsby in 1950 to 1951.

Fish are allowed to stand on the market for 6 to 8 hours after they are unloaded and before they are sold. At Hull, up to 15 percent of the fish remained unfilleted and uniced for as long as 8 hours after the selling of fish began. Fish in the center of a container or stacks of containers rose more rapidly than those at the sides. In the center of a container or stack, at any one time, a considerable variation existed in the fish temperatures registered within a slack or within a single container. At 65° F. air temperature, fish temperatures could be expected to fall within the range 32° to 52° F. within 6 hours after they have been unloaded in the range 30° to 60° F. within 12 hours. At Grimsby, where rectangular containers are stacked 4 to 5 containers high, the fish in different layers varied by as much as 3° to 4° F. At Hull, where do not stacked containers were used, the average temperature of fish before they were filleted was 42.7° F. Grimsby, the average temperature of the fish held in bulk was 39.5° F., and the average temperature of fish held on shelves was 43.4° F.

At both Hull and Grimsby, fillets that had been cut from the fish and washed in 50° F. water rose 4, 5° to 8, 5° F. and had temperatures of about 48° to 49° F. immediately before they were packed in

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ABSTRACTER: Martin Heerd

larger than optimum size in relation to the wet-fish holding capacity. To build a trawler no larger than existing trawlers but more economical to operate now appears possible. This could be accomplished by installing the type of freezing plant described above and by returning to the propulsion machinery that was considered adequate several years ago.

With the combined effort of the Torrey staff and the Area Officials of the White Fish Authority, nearly 300 tons of cod and haddock was frozen aboard the Northern Wave and distributed. Buffer storage of the fresh fish in ice for 3 days before freezing was found to have no adverse effect upon quality. Much of the fish frozen aboard the Northern Wave was thawed according to a procedure developed at the Torrey Research Station, and distributed in lots of about 3 tons each. Part of the frozen fish from the Northern Wave was thawed and distributed through merchants as sea-frozen fish shortly after the arrival of the vessel. The remainder was thawed after being held in frozen storage and then was sold on the open market along with fish from the subsequent autumn trips. Cold storage periods ranged up to 9 months. Some of the merchants purchased frozen fish from all of the trips.

Marketing difficulties.--Because abundant supplies of all kinds of iced fish were available, difficulty was encountered during the winter and spring months in obtaining a ready inland market for thawed fish. Inland wholesalers and retailers criticized the thawed fish filets because they were less translucent in appearance than were fresh filets. Individual consumers, fish friers, and port wholesalers, however, were impressed with the palatability or sea-freshness of the thawed cod. When supplies of iced fish were scarce, thawed fish were sold readily in open competition with newly landed iced fish.

Conclusions.--Buffer storage of the iced fish for up to 3 days, freezing at sea, -20° F., storage at sea, and -20° F., subsequent storage on shore for up to 9 months produces a quality product that can be smoke-cured satisfactorily.

Thus, a chiller of small outside dimensions that could be easily installed or dismantled for maintenance could be made. The chiller had an outer shell of 8-inch Kralastic pipe, which served to (1) reduce the weight of the chiller, (2) eliminate corrosion of the shell, and (3) provide sufficient elasticity to prevent rupture by freeze-up.

With such small chillers being effective, they can be relied on entirely for the cooling without the employment of tank coils. This change would in turn affect other components of the system. For example, on such an installation as that of the Silver Viking, the same flexibility and guarantee against failure could be obtained with two compressors and two chillers as would otherwise be afforded by three compressors. Similarly, two compressors could be driven mechanically, whereas a third one warrants electrical generating and driving. The removal of coils from the tanks would simplify maintenance and would permit the use of cheaper corrosion-resistant coatings.

The Silver Viking engaged in halibut fishing in the December 1956 opening in Area 2. About 36,000 pounds was caught, and the fish were sold 8 to 15 days after they were caught. These fish were in more marketable condition, and samples held in a tank at the Vancouver Technological Station were still in good condition at the end of 29 days. Among the many advantages demonstrated by this trip, the most was that the halibut could be held beyond any period practical in fishing. Elimination of icing of fish increased the effectiveness of the crew; this would result in larger catches in periods of good fishing. The equipment did not appear to hinder in any way the handling of gear or fish.

boxes with ice. After they had been iced in a two-stone box in the normal commercial manner, the fish in the center of the box where they cool most slowly were at about 35° F.

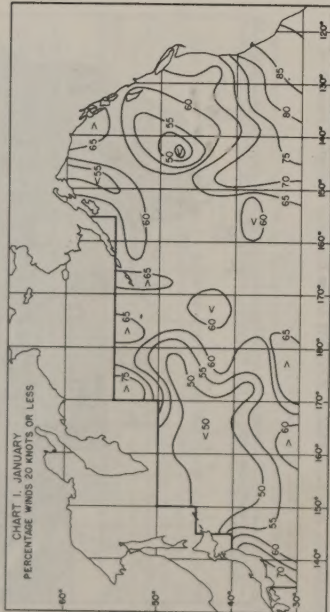
Most of these temperature studies were carried out by the staff of the White Fish Authority.

Transportation of fish.--The British railroads have cooperated in an effort to learn more about the flow of heat into both insulated and uninsulated fish vans. Studies of heat flow under stationary conditions were repeated, and the results were in good agreement with those obtained in 1955. Some heat flow data were collected while the vans were in transit between Hull and London; however, the findings were not as complete as the previous ones owing to the effect of switching shocks on the recording equipment. The findings suggest that if fish are in transit during the summer, the amount of heat leakage through the walls, floor, and roof of the van will melt about 400 pounds of ice in an uninsulated van and about 300 pounds of ice in an insulated van. These vans hold 4 tons of fish and 1 ton of ice. More than half of this ice apparently is required to cool the fish boxes and the van; therefore heat flow through the walls is of secondary importance. The present type of insulated van appears to have relatively little thermal value over the uninsulated van. The reason for this is believed to be the lack of insulation under the floor. Further studies are planned with the object of collecting more accurate data from vans in motion and applying some of the knowledge already obtained.

"This disparity indicates the extent to which the fishing operation can be improved and also indicates the extent to which savings can be effected," he continued. "Only a fraction of the number of submerged lights are needed as compared with above-water lights, which were supplied with electricity generated by use of a petrol engine. Under the new plan, we shall install diesel generators, which will result in a further saving of fuel costs. We estimate that when the whole sardine fleet is equipped with the new generators and underwater lamps, the saving per night of fishing will amount to nearly 1 million francs, or about £ 1000."

McGarry, James W. and Naito, Thomas M. (Pacific Oceanic Fishery Investigations, Honolulu, T. H.) Special Scientific Report: Fisheries No. 243, 35 pp. (September 1957) U. S. Department of the Interior, Washington, D. C.

This atlas comprises a summary of the prevailing winds and speeds in the North Pacific north of 30° N. latitude and was prepared with the hope that it would aid the fishing industry in evaluations and potentialities in that region. The data were obtained from the current files of unpublished wind data maintained by the U. S. Weather Bureau. They represent observations made over a 60-year period by a great number of ships traversing the area.



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Authors' summary

3. 12 COMPARATIVE KEEPING QUALITY, COOLING RATES, AND STORAGE TEMPERATURES OF HADDOCK HELD IN FRESH-WATER ICE AND IN SALT-WATER ICE

Peters, Hohn A. and Slavin, Joseph W. (U. S. Fish and Wildlife Service, Fishery Technological Laboratory, East Boston, Massachusetts)
Commercial Fisheries Review 20, 6-13 (January 1958)

Fresh-water ice, if properly applied, will preserve fish on the vessel for 1 to 2 weeks, depending on the particular species of fish and on the method of icing. The use of an ice that would be acceptable to health and regulatory agencies and that yet would substantially increase the keeping quality of fish would be of great value because it would enable the fishing vessels to stay out longer than now is possible and still return to port with fish of marketable quality.

The storage of fish in salt-water ice, which has a lower melting temperature than has fresh-water ice, would seem to have merit in providing faster cooling and in reducing the storage temperature of the iced fish aboard the vessel.

In the study reported here, representative quantities of haddock were iced in equal amounts of (1) fresh-water ice and (2) salt-water ice (3 percent salt by weight; melting temperature, 29.5° F.) aboard the Bureau's exploratory fishing trawler *DEARE*.

The specific objectives of the experiment were (1) to determine the keeping quality of haddock iced and stored aboard a fishing vessel (using crushed fresh-water ice and crushed salt-water ice [3 percent salt by weight]) and (2) to determine the cooling rates and storage temperatures of haddock stored in these ices.

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ABSTRACTER: Kathryn L. Osterhaug

Farber, Lionel and Lerke, Peter (George Williams Hooper Foundation, University of California, San Francisco)
Pacific Fisherman 56, 15, 16 (March 1958)

Scientists at the Fish Research Laboratory of the George Williams Hooper Foundation in San Francisco have, for the past five years, been studying the efficiency of antibiotics as an aid in the preservation of refrigerated fish.

Repeated studies have demonstrated significant beneficial effects resulting from antibiotic treatments of both whole and filleted fish, especially when the antibiotics were used in conjunction with storage temperatures of 40° F. or lower.

Representative results. -- Figure 1 shows the results of an experiment in which sole fillets were used. The fillets were held for 5 minutes either in a 5-percent salt solution (control samples) or in a 5-percent salt solution that contained 5 p.p.m. of chlortetracycline (CTC). The drained fillets were wrapped in waxed paper and stored at 30° F., 41° F., or 53° F. At intervals, fillets held at each storage temperature were removed and examined by organoleptic, chemical, and bacteriological methods.

Figure 1 shows the accumulation of volatile reducing substances (VRS), which is a measure of the odor and condition of the sample, and the organoleptic judgments. The effects of temperature of storage and of the antibiotic treatment on the keeping quality of the fillets are clearly evident. The 5 p.p.m. of CTC solution prolonged the storage times by 1.55, 3.80, and more than 7.1 days beyond that of the control at 30° F., 41° F., and 53° F., respectively. Antibiotic treatment does not prevent refrigeration but will extend its effect and supplement its action.

Approval for the use of antibiotics of the tetracycline group has not been given to the fishing industry by the U. S. Food and Drug Administration.

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ABSTRACTER: Kathryn L. Osterhaug

3. 12 COMPARATIVE EFFECTIVENESS OF TETRACYCLINE ANTIBIOTICS FOR FISH PRESERVATION

Southcott, B. A.; Baker, E. G.; Boyd, J. W.; and Tarr, H. L. A. (Fisheries Technological Station, Vancouver, British Columbia, Canada)
Food Technology 12, 108-110 (February 1958)

Introduction and experimental. -- This study was made to compare the effectiveness of chlortetracycline (CTC), oxytetracycline (OTC), and tetracycline (TC) antibiotics as preservatives for eviscerated lingcod (*Ophiodon elongatus*), eviscerated rockfish (*Sebastes* sp.), and fillets from these fish under three different methods of application. Lingcod spoils more rapidly than some other commercial species of North Pacific fish.

Experimental fillet storage in bags. -- Eviscerated fish were filleted aseptically, the fillets were skinned, and fillet pieces of reasonably uniform size were dipped for one minute (a) in plain water or (b) in water that contained 5 p.p.m. of antibiotic; were drained for 2 minutes on clean, wire racks; and were stored in polyethylene bags at 0°, 4°, or 10° C. A single fillet from each of the above lots was withdrawn at each sampling interval.

Experimental eviscerated-fish storage in ice. -- Ices containing CTC, OTC, or TC were commercially frozen in 300-pound blocks with carboxymethylcellulose as an antibiotic distributing agent to provide ice that contained 5, 100, and 300 p.p.m. of antibiotic, respectively. Eviscerated fish in large quantities were lightly rinsed in fresh water and iced with crushed antibiotic ice in clean, insulated, galvanized metal boxes. At each interval of sampling, a single fish was removed from the ice and filleted aseptically, and the fillets were stored in closed polyethylene bags for 18 hours at 10° C. to accelerate bacterial spoilage.

Experimental eviscerated-fish storage in refrigerated brine. -- Eviscerated fish in 20-liter lots were immersed in a 3-percent solution of plain sodium chloride or in a 3-percent solution of sodium

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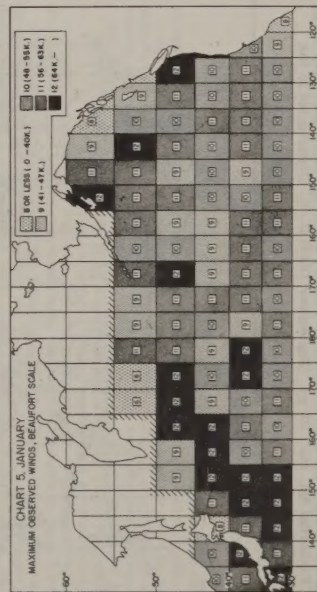
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ABSTRACTER: Martin Heerdt

Organoleptic examinations were made on raw, eviscerated haddock stored in the two ices and on cooked fillets prepared from these fish. The results of these examinations indicate that (1) the fish stored in fresh-water and salt-water ice were of good-to-excellent quality until the 8th day of iced storage, after which time they were of fair-to-borderline quality until the 13th day of storage when they were found to be unmarketable, and (2) there was no significant difference between the quality of the fish stored in the fresh-water ice and the salt-water ice.

The fish stored in salt-water ice were cooled faster and to a lower temperature than were the fish stored in fresh-water ice, and fish lying against the pen boards were cooled at a slower rate than were fish properly iced. Owing to the greater loss of ice, the fish stored in the top of the fish pen rose in temperature faster than did the fish stored in the bottom of the same pen. Similarly, owing to the faster rate of melting and the resulting greater loss of ice, fish stored in salt-water ice, after being initially cooled to a lower temperature than the fish stored in the fresh-water ice, eventually rose to a higher temperature than did the fish stored in the fresh-water ice. Therefore, in order to maintain the fish in the salt-water ice at a temperature close to the melting point of this ice, sufficient quantities of ice must be used to make up for the faster melting.

For each month, with a few exceptions, there are 5 charts; the first 4 indicate the geographical variations of the observed wind speeds that were ≤ 20 , ≤ 25 , ≤ 30 , and ≥ 35 knots respectively. The fifth chart gives the maximum observed wind in Beaufort scale for each 5-degree square of latitude and longitude.



chloride with 1.5 p.p.m. of antibiotic and were stored at -1° to 0° C. In one instance, air was bubbled slowly through the solution in an attempt to counteract the anaerobic conditions that ordinarily prevail in refrigerated brine. Fish stored in brine were sampled in the same manner as were the fish stored in ice.

Results.--Fillets that had been dipped in the antibiotic were considerably and consistently more effectively preserved with CTC than with either OTC or TC irrespective of the temperature at which they were stored. Crushed ice that contained CTC was more effective as a preservative for fish than were either ices that contained OTC or TC. All of these findings were based on both lower direct bacterial counts and lower viable bacterial counts and on the odor of the fillets or eviscerated fish.

Results obtained from the storage of eviscerated fish in refrigerated brine were not so easy to interpret. Rock cod that had been stored in nonaerated refrigerated brine showed no consistent agreement between the total and the viable bacterial counts. Direct counts obtained from this species, however, were higher than were those obtained from the other two species. All three of the antibiotics used with this species gave protection against the development of unpleasant off odors. Preservation was more marked at the 21-day storage interval with CTC as the antibiotic than with OTC or TC. Direct bacterial counts, not viable counts, were somewhat lower with CTC than in control fish. Both OTC and TC viable counts were consistently higher than viable counts obtained from the controls.

Definitive organoleptic and bacteriological improvement was obtained with lingcod held in aerated brine that contained CTC until the lingcod had been held for 20 days. Total bacterial counts were, in general, lower with cod stored in CTC brine, but the spectacular differences encountered with dipped fillets were not obtained. Aeration did not prove effective as an adjunct for holding fish in refrigerated brine.

Conclusions.--In these studies, CTC definitely was superior to OTC and TC for dipped fillets or iced fish. Spoilage that resulted from the storage of cod in refrigerated brine is somewhat more difficult to evaluate and is characterized by the development of unpleasant odors suggestive of diethyl sulfide and hydrogen sulfide.

V. R. S. Microaerobic reduction per 5 ml. press juice

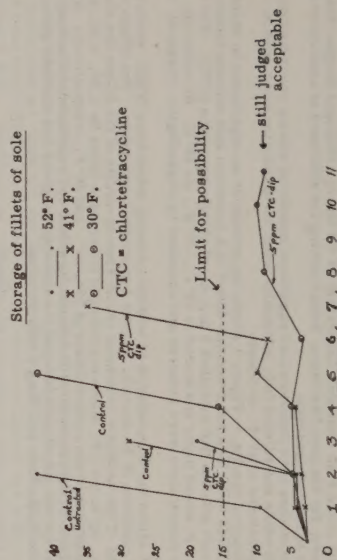


Figure 1. Showing the effect of a 5-minute dip in a solution of 5 p.p.m. of chlortetracycline in 5% sodium chloride on the keeping quality of sole fillets stored at various temperatures.

3. 12 THE POTENTIAL APPLICATION OF ANTIBIOTICS IN THE SALMON CANNING INDUSTRY II. CHEMICAL AND BACTERIOLOGICAL EVALUATIONS

Stern, J. A., Lieberman, H. L., Kudo, G., Chapel, J., Olsen, R. A., Farber, L. L., and Grennan, M. (School of Fisheries, University of Washington, Seattle)
Food Technology 12, 132-137 (March 1958)

Two studies were made to learn the effect of oxytetracycline (OTC) and chlorotetracycline (CTC) on the spoilage of sockeye salmon (*Oncorhynchus nerka*). Study number 1 was concerned with the storage of salmon in refrigerated brine containing OTC or CTC, whereas study number 2 was concerned with the storage of salmon in air after they had been sprayed with antibiotics.

Brine storage of salmon. --Ten wax-lined 55-gallon oil drums were used for the storage of salmon in refrigerated brine. To maintain the desired brine temperatures, the oil drums were placed inside of open wooden tanks--five drums to each of two large tanks. Each drum was lined with a polyethylene bag and filled with refrigerated brine. In some instances, OTC or CTC was added to the brine. Four round sockeye salmon were held in each drum full of brine. Brine storage studies with salmon were conducted (a) at 32°, 40°, and 50°F., respectively, with no antibiotic, 5 p.p.m. OTC, 10 p.p.m. OTC, and 30 p.p.m. OTC and (b) at 32°F. with 5 p.p.m. CTC, at 40°F. with 10 p.p.m. CTC, and at 50°F. with 30 p.p.m. CTC.

Air storage of salmon. --Sockeye salmon held in air at 65°F. were treated as follows immediately upon arrival aboard a tender on the fishing grounds: (a) sprayed with sea water, (b) sprayed with sea water containing 20 p.p.m. OTC, (c) sprayed with sea water containing 20 p.p.m. OTC on two successive days, or (d) sprayed with sea water containing 100 p.p.m. of OTC.

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ABSTRACTER: Martin Heerdt

3. 230 TECHNICAL NOTE NO. 42. --KEEPING QUALITY AND RATE OF FREEZING OF COOKED DEEP-SEA LOBSTER MEAT FROZEN IN CANS

Peters, John A. and Slavin, Joseph W. (Bureau of Commercial Fisheries, East Boston, Massachusetts)
Commercial Fisheries Review 20, 22-27 (January 1958)

Large quantities of deep-sea lobsters were fished in the Georges Banks area off the coast of New England by the U. S. Bureau of Commercial Fisheries exploratory fishing trawler Delaware during the spring of 1955. The finding of these lobsters has led to the development of a new lobster fishery in which several commercial fishing vessels are now engaged.

The deep-sea lobster is of the same species (*Homarus americanus*) as is the smaller lobster found inshore along the coast of New England. The size of the deep-sea lobsters (5 to 15 pounds), however, limits their sale in the retail live-lobster market, which handles principally 1/4- to 2-pound lobsters. Attention therefore, is being given to other methods of marketing them.

A successful method of preserving lobsters by suitable refrigeration techniques would be of value because it would provide a greater market for the lobster meat. Accordingly, studies have been started at the Bureau's Fishery Technological Laboratory at East Boston, Massachusetts, on the freezing and storage of deep-sea lobsters.

Cans, being impervious to the transmission of moisture and oxygen, make an ideal package for frozen fishery products. Cans have not been used extensively as a package for frozen lobster meat; therefore, information is necessary on the effect of (1) various levels of vacuum in the can, (2) various storage temperatures, and (3) the addition of brine in order to furnish data that will enable

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ABSTRACTER: Kathryn L. Osterhaug

ANTIBIOTICS FOR FRESH SALMON

FREEZING LOBSTER MEAT

3. 2341

SUPER-COLD FREEZES FOOD SUPER-FAST

Anonymous
Food Engineering 31, 114 (February 1958)

A new air-blast freezing tunnel has been installed at St. Simon Island, Georgia, for flash freezing breaded shrimp. The extreme low temperature of this tunnel has reduced drip loss in shrimp from 5 percent to 0.2 percent. Breaded shrimp that normally required 2 hours to become completely frozen now require only 13 minutes.

The new tunnel is made of concrete and steel and insulated with 12 inches of foam glass. The dimensions of the tunnel are 76 by 18, 8 by 10 feet. The tunnel consists of a freezing area with fore and aft anterooms. A two-stage ammonia refrigeration system with a total capacity of 52 tons refrigeration is used to obtain -50°F. air for the tunnel. Three blowers circulate the cold air through the refrigerated coils and through the tunnel. Adjustable louvers are used to control the direction of air flow.

As the raw shrimp enter the plant, they are washed, graded, peeled, deveined, and individually pinned by the tail onto special steel racks. The pinned shrimp then are immersed in batter to the depth of the tail joint and coated with a special blend of breading. Filled racks of breaded shrimp are loaded onto special freezing carts. These are lined up in the first anteroom, which is held at 0°F. The filled carts are pushed automatically at timed intervals into the freezer tunnel. Once inside the tunnel, a hydraulic pusher advances the carts through the tunnel at a uniform rate of forward motion. The freezer tunnel holds 14 carts. Thirteen minutes after a cart enters the tunnel, it is pushed through the exit door and into the second anteroom. At this stage, the solidly frozen shrimp are removed from the racks and made ready for packing.

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ABSTRACTER: Martin Heerdt

3. 336

CANNING OF FOODS

Clifton, L. E. (American Can Co.)
Refrigerating Engineering 69, 74, 76, 77 (March 1958)

Bacteriological aspects of canning have been under control since the early 20's. Thermal processes to make canned foods commercially sterile are accurately determined for each product and for each can size. Mechanization and automation have assisted greatly in attaining higher speeds and labor saving on the canning line, bringing about economical production.

During sterilization free flowing liquid products are heated by convection currents. Many semi-liquid products are heated by both convection and conduction. When movement of the contents along the walls of the can by convection is slow or nonexistent, heat transfer is by conduction alone and long processes are required. Heat transfer to the coldest spot in the canned product is very slow, particularly with the larger size cans. In such instances, the food is apt to scorch along the can walls. In many instances this situation led to the employment of high temperature-short time processes to overcome this deficiency and to upgrade quality and nutritive value.

In general, it may be postulated that the destruction of bacteria increases tenfold for each 18°F. (10°C.) rise in processing temperature, while the chemical reactions responsible for product deterioration are only doubled. This relationship indicates the effect of temperature on the rates of destruction of thiamine and typical bacteriological spores. The greater retention of thiamine is possible at the higher processing temperatures.

Reluctance of the canning industry to accept improved canning techniques can be explained solely on the basis of the economics involved. Seasonal canners cannot afford expensive equipment, which is idle nine months of the year. However, moderately priced high temperature-short time equipment for such operations is now available and slowly finding acceptance.

Much of the improved quality gained by the use of high temperature-short time or agitating

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SUPER-COLD BLAST FREEZER

DEVELOPMENTS IN CANNING

processors to produce a frozen canned product of high quality at minimum cost.

Blast freezers provide rapid freezing and are commonly used in the fishing industry. Data on the freezing rates of lobster meat packed in cans consequently would be useful to plant operators contemplating the freezing of lobster meat in existing blast freezers and to engineers designing new equipment for freezing this product.

Objectives.--The following, therefore, were the objectives of the present small-scale preliminary experiments: (1) to determine the keeping quality of blast-frozen canned cooked lobster meat as affected by (a) the amount of vacuum in the can, (b) the temperature of storage, and (c) the addition of brine and (2) to determine the rate of freezing of the canned lobster meat in a blast freezer.

Results.--Cooked lobster meat stored in cans for 18 weeks at -20°F . kept well and was apparently of better quality than was cooked lobster meat stored in cans for the same time at 0°F . The amount of vacuum in the can did not appear to affect the keeping quality appreciably. Samples of cooked lobster meat containing 2.5 percent salt brine, packed at 27 inches of vacuum, frozen, and stored for 18 weeks at -20°F . were at about the same level of quality as those not containing brine but otherwise packed under the same conditions.

With lobster meat packed 1 pound per No. 2 can, 100 minutes was required to cool the cooked meat from 45° to -20°F . in an air blast having a temperature of -10° to -35°F . and a velocity of 1,500 feet per minute over the cans.

Amounts stored and sampled.--Four sockeye salmon were used in each of 15 lots stored in refrigerated brine and 5 lots stored in air. Individual salmon were removed at specific intervals for canning. A single steak cut from each salmon was sampled, ground, canned, frozen, and held for chemical and bacteriological analyses. The remaining steaks from each fish were canned according to commercial practice and held for chemical, bacteriological, and organoleptic analyses.

Organoleptic examinations.--Organoleptic examinations were made at the University of Washington in Seattle by a panel of individuals from the salmon canning industry, and at the California Packing Corporation in San Francisco by a panel of individuals from the University of California and the California Packing Corporation.

Findings in general. Antibiotics extended (1) the overall storage life of fresh sockeye salmon and (2) the period of time during which the fresh salmon were judged to be good in quality. Differences were not apparent in the effect of OTC and CTC on the storage life of the salmon. Differences of sockeye salmon in refrigerated brine and air were not apparent in the experiments for the storage of sockeye salmon in refrigerated brine and air. All levels of OTC and CTC used appeared to be equally effective or salubrious than that held in refrigerated brine. The spray that contained 100 p.p.m. of OTC was more effective than the spray that contained 20 p.p.m. of OTC for extending the storage life of salmon held in air at 65°F . Extension of the storage time was, however, always depended upon the storage temperature. At 65°F . the extension of storage time was relatively short, whereas at 32°F . the extension of storage time was long. Chemical and organoleptic examinations substantiated the above conclusions. The bacteriological determinations yielded inconclusive results, probably because the samples were stored at freezing temperatures prior to examination.

Specific findings.--Volatile acid and volatile base determinations of fresh frozen samples indicated only very slight differences between the two antibiotics or between the effects of the various levels of antibiotics used with salmon in refrigerated brine. Volatile acid determinations of fresh frozen samples were somewhat better correlated with organoleptic determinations than were volatile base determinations. In the canned salmon, volatile reducing substances values paralleled the organoleptic findings more closely than did the total volatile N or trimethylamine N values, which appeared to be of little value.

processes is lost if the canned goods are later stored at ambient or warm temperatures. Coincidentally, the most heat sensitive canned products--whole milk and orange juice--are also the most storage sensitive. Immediately after canning these products compare favorably with pasteurized fluid milk and fresh orange juice. Also in this general class should be mentioned Blair peas, processed by a special technique to retain the green color, and canned corn. Refrigeration to cool storage conditions is necessary to hold the original high quality of these products.

The downfall of canned whole milk and canned single strength orange juice has been due to carelessness in holding these products during storage.

Color, flavor, and nutritive value of pureed baby foods are markedly upgraded by high temperature-short time processing. However, under general prevailing storage conditions this high quality rapidly downgrades to meet that of the commercially processed product in about three months.

Generally speaking, the quality of all canned foods is maintained at a higher level by cool storage. Corrosion of the containers is retarded, giving a longer shelf life. Losses by some canners due to hydrogen springers, perforations, and product degradation would go a long way in paying for cooled warehouses.

Although the prospect for refrigerated warehouses for canned foods does not seem bright, the canning industry faces a long range problem in regard to flavor and nutrient quality of canned foods as affected by adverse storage temperatures. At present the canner, the broker, and eventually the consumer, must be further educated in the advantages of cool and proper storage of canned foods. Much can be done by proper warehouse construction and ventilation. Night cooling is most helpful.

Canned foods cannot be upgraded a full grade by cool warehousing, but their original grade quality can be preserved against downgrading. This should bring about an increased sale of canned goods because of better quality.

The greatest future for canned foods, perhaps, is for those products which could not be distributed otherwise. Many products which are partially sterilized or pasteurized for the sake of quality must be held under refrigeration for preservation. Nonsterile luncheon meat and whole hams are refrigerated canned products of very large volume. Although other cured meat products have been packed by this method, few have been developed and promoted.

A new plastic coating that permits visibility has been developed for slow-frozen meats. The coating is applied by dipping the frozen cuts of meat in a chemical solution that completely encases the product. This method of packaging may be of interest to meat packers who are presently using packaging materials that block product visibility. In one store in which the plastic-wrapped meats are being marketed, the volume of these meats is now up to one-third the volume of fresh meats. Introductory prices of the frozen cuts have been the same as comparable cuts of fresh meats. Dipping adds to the material cost of fresh meats; however, the absence of spoilage waste and shrinkage in dip-wrapped fresh meats compensates for the added cost.

The dip-wrap process. --Trimmed fresh cuts of meat are blast frozen at -20°F ., electronically weighed, price marked according to weight, carried by overhead conveyor to the first vat, and dipped in the plastic. Frozen meats emerge from this vat with the plastic coating dripping from them. Visibility is the same as that obtained with cellophane. The frozen meats are then dipped a second time and allowed to drip dry before they are returned to the freezer to await shipment. This second dip provides a sticky finish that makes the frozen meats easier to handle and stick; however, plans are in progress to eliminate the second dip.

Home preparation. --To prepare these meats for cooking, they should be allowed to stand for 30 minutes at room temperature. The plastic coating then may be cut with a sharp knife and peeled from the meat.

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3, 249 FURTHER STUDY OF THE INFLUENCE OF SHORT STORAGE PERIODS,
3 DAYS TO 2 WEEKS AT 15°F ., ON THE QUALITY OF FROZEN COD
STORED AT 0°F .

Dyer, W. J.; Fraser, Doris I.; and MacCallum, W. A. (Fisheries Technological Station, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 14, 925-929 (November 1957)

Introduction and purpose. --According to Dyer et al. (1957) packaged cod filets that were stored at 0°F . for 1 month or longer, stored at 15°F . for 14 days, and then stored at 0°F . deteriorated considerably in quality. These findings were based on sensory observations by taste-panels and on the extractability of the cod protein. A second study was made to investigate the effects of exposing frozen cod filets to 15°F . for 3 days and for 7 days for comparison with the findings obtained in the previous study in which filets were exposed to 15°F . for 14 days.

Experimental. --Filets from fresh cod that had been iced for two days on the vessel were frozen, filled into 1-pound packages, and packed into master cartons that held twenty-four 1-pound packages. Lots of these cartons were then stored separately as follows: Control lots A and G were stored respectively at 0°F . and at 15°F . Experimental lots B, C, and D were stored for 1 month at 0°F . Then lot B was stored at 15°F . for 3 days and returned to storage at 0°F ., lot C was stored at 15°F . for 7 days and returned to 0°F . storage, and lot D was stored at 15°F . for 14 days and returned to storage at 0°F . Experimental lots E and F were stored for 3 months at 0°F . Then lot E was stored at 15°F . for 3 days and returned to 0°F ., and lot F was stored at 15°F . for 7 days and returned to storage at 0°F .

Analytical findings. --Composition of the filets in percentage values after storage was as follows:

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An accurate method for measuring changes in the protein of cod that have been in frozen storage is not presently available. Soluble protein nitrogen, which is a measure of protein quality and is expressed as a percentage of the total protein, may be determined by extracting fish muscle with chilled dilute salt solutions. This method originally was considered unsatisfactory as a basis for the measurement of deterioration in fish in frozen storage. Causes of the initial variations now have been explained, and they can be eliminated. The variations are small if instead of using minced whole filets, a few of the widest myotomes or muscle segments of the filets are dissected out, freed from the myocommata or partition membranes between the myotomes, and used as material for the extraction. Sometimes variations occur in fresh fish in spite of these precautions. The extent of this variation has since been shown to be seasonal.

The rate of freezing of fish governs the extent of deterioration in cold storage to a much larger extent than was previously suspected. Frozen fish that were stored at -7°F . exhibited a steady decline in soluble protein irrespective of the rate of freezing. Such deterioration is greatest when the fish being frozen required about 80 minutes to pass through the critical temperature range of 33° to 23°F . After about 6 months of storage, soluble protein reaches a low of about 20 percent irrespective of the rate of freezing. Freezing was pronounced, further with extended storage. In frozen fish stored at -20°F ., the effect of the rate of freezing was pronounced; whereas the rate of denaturation was retarded. After the fish had been in storage for a year, denaturation of 68 percent of the soluble protein resulted from freezing times of 70 to 100 minutes in the critical zone; whereas virtually no denaturation resulted from freezing times of 10 minutes and 200 minutes in the critical zone, and very little denaturation resulted from a freezing time of 400 or more minutes in the critical zone. A decline in

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3, 6 NEW DEVELOPMENTS IN DEHYDRATION

Tressler, Donald K.

Refrigerating Engineering 65, 50, 68 (March 1958)

Improvements in dehydrated foods have been made possible by the recognition of certain simple facts which have been known but had not yet been applied to commercial dehydration.

For example, nonenzymatic browning (the Maillard reaction) can be controlled in a number of ways: (a) reduction of moisture content to 1% or lower; (b) elimination of carbohydrates; (c) treatment with sulphur dioxide or sulphites; (d) refrigeration of the dehydrated product. If methods (a) or (b) are used, the resultant dehydrated product will be more stable than conventional canned foods which have been heat processed.

Too, freezing prior to dehydration at a low temperature and under a high vacuum produces a very porous structure in the dehydrated product. Freeze-dried foods and "puff-dried" purees can be rehydrated in a few minutes yielding a refreshed product closely resembling the fresh food.

Oxidation of lipids (rancidity) and carotene can be largely controlled by packing the dehydrated foods in an atmosphere totally devoid of oxygen.

Precooked foods can be dehydrated. The perfection of satisfactory methods of dehydrating precooked foods has made possible a whole new line of convenience foods which refresh in a few minutes after the addition of boiling water and require no cooking.

Freeze drying, perfected during World War II as a means of preserving antibiotics without affecting their potency, has found new uses. Cooked shrimp can be dehydrated, yielding a product which may be prepared for the table by a few moments immersion in either hot or cold water. More recently freeze drying has been shown to be readily applicable to the dehydration of both raw and cooked fish and many shellfish other than shrimp.

Microwaves (dielectric heat) have been proposed for use in speeding up freeze drying, since this

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meatime 81.7, total nitrogen 2.80, nonprotein nitrogen 0.31, water-soluble protein nitrogen 0.54, trimethylamine 1.1 milligrams nitrogen per 100 grams of tissue, trimethylamine oxide 81.7 milligrams nitrogen per 100 grams of tissue, and protein nitrogen 2.49 percent of which 22 percent was albumin. These values did not change during storage.

Flillet storage findings.--Fillets in lots A and G became unacceptable after 6 months of continuous storage at 15° F. Fillets in lot B, C, and D, all of which were stored for 1 month at 0° F. and then for 3, 7, and 14 days respectively, at 15° F. before being returned to 0° F. storage--varied in quality.

Fillet storage findings.--Fillets in lot D were returned to 0° F. storage immediately after 14 days of storage at 15° F. After the fillets in lot A: their total keeping time or storage life, however, was reduced to about 4 months. Fillets in lot C declined in quality similarly to the fillets in lot D but only to the extent of about 15 percent immediately after 7 days' storage at 15° F. This reduced the total keeping time of the fillets in lot C to just over 4 months. Fillets in lot B that received a 3-day exposure to 15° F. were similarly affected, their quality declined by 10 to 12½ percent, and their total keeping time was about 4½ months.

Fillets in experimental lots E and F that were exposed to 15° F. after three months of storage at 0° F. declined rapidly in quality to about the same degree as the fillets in lots B and C. Exposures of 3 or 7 days at 15° F., therefore, were almost as detrimental to fillet quality as were exposures of 14 days at 15° F.

Extractable protein findings.--Actomyosin extracted and expressed as a percentage of the total protein decreased very rapidly in fillets exposed to 15° F. The decrease was largest in fillets in lot D, somewhat less in lot C, and least in lot B. The decrease in lots E and F was, respectively, about one-third of that in D and about the same as that found in C.

Conclusions.--Storage for periods of 3 to 14 days at 15° F. caused a very definite deterioration in the quality of frozen fish held under conditions that simulate refrigerated-car transportation. This deterioration is equivalent to a loss of 2 to 3 months out of the 2 to 8 months of storage life that normally can be expected from commercially frozen cod fillets that are stored continuously at 0° F.

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Meats suitable for dipping.--All cuts of beef, pork, lamb, veal, and even ground beef are suitable for dip-coating with the plastic after they have been frozen. Storage studies indicate that the frozen plastic-coated meats can be held for as long as one year without loss of flavor, moisture, or weight.

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system produces the heat right in the interior of the product. Meat and many other foods of high quality have been freeze dried under high vacuum using microwaves to hasten dehydration. The products are of excellent quality, but the cost of the equipment required for the process is quite high.

According to the Smithies process, pieces of meat are pushed down onto a metal plate which has a large number of protruding short pins which penetrate the meat. A similar metal plate, studded with pins, is pushed on top of the meat. The meat is then frozen. After freezing, the meat is placed in a freeze dryer where it is subjected to a lower temperature and to dehydration.

Strauch and Talburt (1953 and 1954) and others have perfected a method of dehydrating orange juice which yields a powder which can be easily reconstituted to obtain beverage juice of good quality. Further, the product, unlike dehydrated juices produced by other processes, retains its high quality throughout a long storage period at 70° F. or for 6 months or longer at 100° F. (Myne and Seaman 1954).

A continuous vacuum dehydrator has proved to be highly satisfactory for the continuous production of orange juice powder. The apparatus consists of a vacuum chamber housing an endless stainless steel belt running over two drums, one hot and the other cold.

This process is now being successfully used in Florida for the production of orange and grapefruit powders ("crystals").

Dry nonfat milk and dry whole milk powder have been produced commercially for many years. The dry nonfat milk is fairly stable; however, it does not disperse readily in cold water. This does make a desirable beverage if it is dispersed in hot water, mixed with melted butterfat (salt-free); the mixture is homogenized and cooled. The whole milk powder develops stale and "fallow" flavors rather rapidly, even if it is packed under nitrogen or in a high vacuum.

Products having a fat content much higher than whole milk (8%) have been satisfactorily dehydrated. The product is fairly stable if packed in an inert atmosphere and is suited for use in hot coffee, but it is not easily dispersed if cold.

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soluble protein from 96 percent to between 80 and 90 percent always occurred as a result of freezing and thawing immediately thereafter.

The relation between the amount of soluble protein and the texture of the cooked fish as judged by tenderness on eating has not been established. Sensory estimation of tenderness for the quantitative comparison of numerous samples is difficult, and in this study not all of the samples examined chemically could be evaluated for tenderness. Under some conditions, the findings seemed to indicate that toughening can proceed to some extent without an accompanying decline in soluble protein.

If fish fillets are frozen in containers or between plates in a contact freezer, they may be subjected to an increase in pressure from that of mere contact to as much as 20 kilograms per square centimeter. These pressures did not appear to have any traceable effect on the tenderness or eating quality of the fillets. Fillet tenderness, however, may be affected if the rate of cooling is increased by better contact and therefore brought into the range in which protein denaturation is maximum. Fillets may be deformed if they are allowed to expand and become subject to a large amount of cell rupture during freezing.

The recommended code for the quick-freezing of fish requires cooling through the critical range 32° to 23° F. in not more than 120 minutes. Recommended practice for storage is a temperature of -4° to -20° F. Previous experience suggests that the rate of freezing has relatively little effect on the quality of frozen fish, whereas the temperature of storage has a large effect on quality. The findings reported do not agree with previous experience. Further studies will be made in an attempt to describe as nearly as possible the combined effects of the temperature of storage and the rate of freezing on palatability or eating quality as it applies to texture and to protein denaturation.

Electrostatic smoking.--A method of smoking that is based on the deposition of charged smoke particles in a field-free space has been used as an aid to smoking herring and haddock in a 50-stone size Torry kiln. Equipment of this type was installed, insulated adequately, and operated safely without difficulty by the staff of the Herring Industry Board factory at Lerwick. Commercially acceptable whole kippers, kipper fillets, and haddock fillets were prepared by the electrostatic smoking process.

Electrostatically smoked fish have a richer and deeper smoke color than do the ordinary smoked fish. Electrostatically smoked kippers, immediately after smoking, had about 1/500 as many bacteria and twice the quantity of phenols as did kippers smoked in the ordinary manner. However, the electrostatically smoked fish contained smaller amounts of 2-methoxy-4-ethyl and 4-propyl phenols and 2-methoxy-6-methyl, ethyl, and propyl phenols. Fish smoked electrostatically with low density smoke had better final quality and keeping quality than ordinary smoked fish. These differences were not apparent in fish that received high density smoke. Electrostatically smoked kippers stored at 30° F. and -20° F. showed less oxidative rancidity than ordinary smoked kippers stored at the same temperatures.

Smoke production.--A full scale model of a "fluidized" sawdust smoke producer has been used in commercial trials at Lerwick, where it was installed in a 50-stone Torry kiln. Smoke output was smaller than anticipated; however, commercially acceptable herring and haddock fillets were produced by burning sawdust at the rate of only 4 pounds per hour. By comparison the ordinary firebox of the

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3. 63 DRYING FISH AND BEEF PRIOR TO SOLVENT EXTRACTION

Arnold, Lionel K. and Hsia, Pong R. (Iowa Engineering Experiment Station, Iowa State College, Ames) *Journal of Agricultural and Food Chemistry* 6, 231-232 (March 1958)

Moisture- and fat-free meat has possibilities as a useful food for both military rations and emergency civilian rations. Fish might--in the dry, fat-free form--be used to supplement the food of peoples whose diets are now deficient in animal protein and who do not have adequate refrigeration facilities for fresh meat and fish. There also are large quantities of fish-processing wastes and inedible fish, byproducts of the fishing industry, that could be processed to form excellent high-protein animal feed. Some fish products are being solvent extracted, but most of the fish oil and meal are produced by either wet reduction or dry rendering. These processes consist essentially of cooking followed by pressing.

Fat in undried meat and fish does not extract readily. Previous work showed that inedible meat and fish scrap could be solvent extracted satisfactorily at moistures of 7 and 20 percent, respectively--provided the scrap was not overheated in drying. Ordinary drying-oven temperature (230° F.) coagulated the protein of both fish and beef sufficiently to prevent satisfactory extraction.

Freeze drying fish and beef.--In freeze drying, the water is evaporated at low temperatures under reduced air pressure to avoid the bad effects of high-temperature drying. Usually during freezing, ice crystals form outside the cells, facilitating drying. The frozen tissue is usually porous, which should allow good solvent extraction of the fat. Preliminary observation showed that freeze-dried meat was light, fluffy, and apparently porous.

The greatest objection to freeze drying is the cost. Theoretically, however, the cost of freeze

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Irving, George W., Jr. (U. S. Department of Agriculture, Washington, D. C.) *Journal of the American Oil Chemists' Society* 35, 4 (March 1958)

The most important factor in the United States fats and oils situation in the last two decades has been the phenomenal increase in production, attaining in recent years a level 75% above that of 20 years ago. Domestic use of fats and oils is now larger than before World War II, but the consumption rise has not been as great as the rise in production. The net effect of these trends has been to make large quantities of all major domestic fats, oils, and oilseeds available for export or as raw materials for new products. This means that there is opportunity and need to intensify research to aid in expanding export markets and in developing new, profitable products from fats and oils and thus to maintain adequate markets for prospective production.

A balanced research program in this field recognizes (a) that production of fats and oils is not responsive to demand, primarily because most fats are joint products or byproducts; (b) that, while fats tend to be in surplus, we expect an expanding market for the joint product of vegetable oil production, protein meals, because of increasing livestock production; (c) that per capita consumption of total food fats is not likely to increase significantly but greater emphasis will be placed on the qualitative aspects of dietary fat; (d) that expansion of export markets for fats and oils depends to a great extent upon price and our ability to meet quality characteristics preferred abroad; (e) that existing foreign markets for our products are not being fully utilized; (f) that production of food fats from foreign or joint products at competitive prices; (g) that individual oilseeds and oils as raw materials will be undertaken only when there is assurance of an adequate supply of uniform quality fats and oils at reasonably steady, attractive prices.

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4. 87 PROGRESS ON STUDIES IN UTILIZATION OF FISH-OIL DERIVATIVES
IN ORE FLOTATION

Cooke, S. R. B. (School of Mines and Metallurgy, University of Minnesota, Minneapolis) *Commercial Fisheries Review* 20, 14-19 (January 1958)

Flotation is a process of ore concentration used to separate a specific mineral or group of minerals, called the concentrate, from another mineral or group of minerals, known as the gangue or tailing. To effect the separation, operators use chemical reagents. These reagents are commonly divided into four groups known, respectively, as collectors, frothers, activators, and depressants.

High specificity of a reagent in its given function should result in a highly selective flotation separation; that is, concentrate should be quantitatively separated from tailing. Probably the most selective separations made today are those between the sulphide minerals and gangue minerals such as oxides, carbonates, quartz, and silicates. The separations of nonsulphide minerals, one from the other, are more difficult to effect. Various organic compounds have been proposed and utilized, both in the laboratory and in practice, as collectors for oxides, carbonates, silicates, and other minerals. Usually, such minerals have low unit value, and the high cost of some reasonably effective reagents automatically excluded them from use.

The practical separation of the nonsulphide mineral dates back to the Christensen patent (U. S. pat. 1,467,358), in which fatty acids and their soaps were proposed as collectors. Since then, it has been shown that with proper control of other factors, the fatty acids and their soaps, alkyl sulphates and sulphonates, alkylamines, quaternary ammonium salts, and pyridinium salts can be utilized to make reasonably effective separations.

Of the foregoing substances, the fatty acids and their soaps are the cheapest. Fish-oil acids and their soaps have been used in the past, but they are not currently in favor.

Although the consumption of fatty acids in ore flotation is small in terms of pounds per ton of

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drying should be comparable with that of canning and should produce a flavor in the reconstituted product similar to that of fresh meat.

Experimental procedure.--Rates of extraction were determined by passing the solvent upward through about 5 grams of ground fish or beef in a 1-inch, jacketed, glass tube at 10 ml. per minute. The solvent-oil solution, or miscella, coming from the extraction tube in each 10-minute interval was evaporated separately, and the resulting oil was weighed to determine the amount extracted in that interval. Amount of oil in both the original and extracted product was determined by extraction in a Soxhlet apparatus after drying the product in an oven at 230° F. to determine the moisture content.

Freeze drying was done as follows: A mixture of fifty grams of ground fish or beef and 100 ml. of distilled water was frozen in a 2-liter round-bottomed flask by rotating the mixture in a bath containing dry ice and ethyl alcohol to produce an even coating on the inside of the flask. The flask was connected through a water trap to a vacuum pump and maintained at a pressure of 0.2 mm. or less for 10 hours.

Results.--Fresh, undried fish and freeze-dried fish containing 12.7 percent moisture were extracted. Both the freeze-dried beef and fish extracted more rapidly than did the fresh materials. The extraction of both materials increased with increase in temperature, but the undried fish extracted slightly better at 70° F. than at higher temperatures.

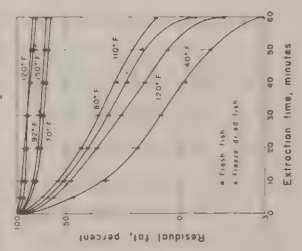


Figure 1. Extraction rate curves for fish

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Torry kiln, burns about 28 pounds of sawdust and chips per hour. A lack of adequate air heater surface caused the low smoke output. This heater will be redesigned to provide a larger amount of heat transfer surface.

Processing and quality control for kippering.--A scheme for the voluntary assessment of the quality of kippers is under trial. A quality assessment panel that has a degree of accuracy suitable for laboratory purposes will be established. Even the relatively crude technique used so far has demonstrated the effect of inferior processing methods upon keeping quality. The cleanliness of the brine and a reasonable amount of smoking and drying have been approved by all firms participating in the assessment of quality.

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crude rock (ranging from 0.5 to 2.5 pounds per ton), the over-all consumption in the United States is impressive. The cement industry uses about 1,000,000 pounds of fatty acid annually; fluor-spar flotation, about 500,000 pounds; and baryte, over 600,000 pounds. Treatment of iron ore has lagged behind that of other ores in this respect, primarily because of the relatively high cost of reagents, but two Michigan mills are currently treating approximately 3,400 tons of ore per day. The average annual consumption of crude oleic acid in these two plants is about 2,500,000 pounds. With the depletion of high-grade iron ores in the Lake Superior region, flotation is in the position of being a competitive means of concentration, and fatty acids and related materials will be used for this purpose. In view of the great tonnages that are to be treated, the consumption of fatty acid will be very large. This fact explains the preoccupation with iron-ore flotation in the contract with the U. S. Fish and Wildlife Service.

Flotation of iron ore with fish-oil derivatives as collectors.--The purpose of the contract with the U. S. Fish and Wildlife Service is to study the applicability of fish-oil fatty acids and of their derivatives to the selective flotation of nonsulfide ores and mineral aggregates and to find out if such reagents are technologically competitive with fatty acids derived from other sources.

Most of the investigation has been confined to a close study of the response of a Messabi wash-ore falling to various aliphatic acids. Oleic acid was used as a control and was of different degrees of purity, ranging from Eastman oleic acid (approximately 93 percent oleic acid) to pure oleic acid (99 percent) furnished by the Hormel Institute. The acids investigated were various bulk unsaturated fatty acids derived from fish oils in laboratories of the University of Minnesota, a long series of unsaturated fatty acids separated from tuna and menhaden fish oils by the Hormel Institute and a number of other fatty acids the behavior of which, as collectors for hematite, required investigation.

An empirical relationship exists between the iodine value of a number of fatty acids and the corresponding selectivity indices for an iron-ore wash tailing, with use of 0.3 pound of the collector per ton of ore, a pH of 6, and floating at room temperature. Maximum selectivity index was found to occur between pH 6 and 7 for all except one or two unsaturated fish-oil acids. A general conclusion is drawn from this work to date is that at room temperature, the highly unsaturated fatty acids are potent frothers, and when present in moderate concentration in a mixture of fish-oil acids, they contribute to the excellence of a separation.

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Of the three major outlets for fats and oils, the utilization of these products or their constituents as industrial materials offers the greatest promise of substantially larger volume use. A large industrial market for fats and oils exists in the fields of the plastics, detergents, pigments, plasticizer, special lubricants, resins, detergents, and related industries. Because of the variety and rapidly growing demand for these products there is good opportunity for developing new products from agricultural oils and fats that have the special properties now demanded by those who consume them. Annual production of synthetic plastics exceeds a billion pounds and is growing steadily. By suitable chemical modification, the chief constituents of fats and oils can be converted to plasticizers, which may contribute not only flexibility but other desirable properties, such as heat and light stability and moisture resistance. Large quantities of additives are necessary for the 18 billion pounds of lubricants now consumed each year, and fats can be used for the preparation of some of these. Certain fatty derivatives improve wetting ability or oiliness. Those which contain sulfur, phosphorus, or chlorine improve load-carrying capacity; other derivatives increase resistance to corrosion or act as detergents or antioxidants. Fats can also serve as sources of intermediates for the preparations of synthetic lubricants and hydraulic fluids for special purposes.

Primary emphasis on the development of new industrial uses for fats and oils should not minimize the importance of research to improve food fats. It is now apparent that the nutritional and physiological aspects of edible fat and oil products must be taken into account in their manufacture. Research should continue to develop improved, specific, and sensitive analytical methods, to determine the relationships between the types of fat consumed and human health, and to establish specifications for the best edible fat and oil products. With specifications established, research can develop means to tailor fats and oils to required nutritional and physical properties.

Adequate, coordinated research programs, involving all aspects of the production, utilization, and marketing of fats and oils, pursued with these principles and opportunities in mind, can help the fats and oils segment of our agricultural economy contribute effectively to a balanced, progressive, and prosperous agriculture.

4. 7 U. S. FISH OIL EXPORTS DROP IN 1957 Anonymous Fishery Products Report B-55, p. 4 (March 19, 1958) (Market News Service, Boston, Massachusetts) United States exports of fish and fish-liver oil in 1957, at 57,470 short tons, were one-fifth below those of the previous year and were the smallest since 1953--probably due mainly to the fact that United States fish oil production dropped one-fourth from the previous year. Production (excluding fish-liver oils) was 74,455 tons in 1957 against 99,878 tons in 1956. Western Europe was again the major market taking over 95 percent of total shipments. Exports to the Netherlands were down about one-half from 1956, while shipments to West Germany were down about one-fifth. However, reports indicate that most of the fish oil imported by the Netherlands eventually also is reshipped to West Germany. In the last 5 years the United States has been the world's leading supplier of fish oil. About one-third of world exports were of United States origin from 1954 through 1956. Of the 1957 exports, 1,410 tons were shipped to Canada, Cuba, and Mexico (the bulk to Canada), 42 tons to South American countries, 55,683 tons to European countries (West Germany 26,296 tons, Netherlands 13,907 tons, Sweden 7,718 tons, Norway 5,272 tons, and the balance to Belgium, Luxembourg, Italy, Switzerland, and the United Kingdom), 18 tons to Asiatic countries, and 305 tons to African countries. United States fish-oil (including liver-oil) exports in 1956 totaled 71,348 tons, 71,338 tons in 1955, 70,817 tons in 1954, 34,233 tons in 1953, 23,079 tons in 1952, and an annual average of only 1,234 tons for the years 1955 to 1959. COMMERCIAL FISHERIES ABSTRACTS VOL. XI, NO. 6 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	6. 3 BRIGHT FUTURE FOR SEAWEED Anonymous Food Manufacture 33, 80 (March 1, 1958) The ash content of seaweed may range from 15 to 25 percent of its dry weight. This ash usually contains about 60 minerals in trace or microquantities. Seaweed usually contains about the same amount of fat and protein as is found in vegetable matter grown on land. It has been reported to be exceptionally high in vitamins, especially carotene, vitamin B₁, vitamin E, folic acid, folinic acid, and vitamin B₁₂. Seaweed is the only known vegetable source of vitamin B₁₂. Mineral value.--Seaweed is used principally for its value as a mineral supplement. Many of the minerals found in seaweed are not known at this time to be essential for animal nutrition. The subject of essential minerals is, however, in need of further study. The use of seaweed as a food supplement or as a fertilizer to return minerals to the land seems to be a desirable policy; however, the value of this policy has not been demonstrated. Seaweed meal for animals.--A brand of seaweed meal presently being produced in Norway has produced beneficial results as a food supplement. Investigators at Utrecht University have reported a 10 to 20 percent increase in the blood hemoglobin of animals that received a 3 percent supplement of seaweed meal in their diet over a period of 3 months. Other feeding experiments made in Holland indicate that cows receiving seaweed meal showed an increase in milk production and in the vitamin A content of their milk. Seaweed meal for sheep.--Sheep that received seaweed meal produced more lambs, better and larger quantities of wool, and pelts of exceptional quality. Pigs that received seaweed meal reached (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XI, NO. 6 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE
6. 130 DANISH COLD-PROCESSING METHOD Anonymous Fisheries Newsletter (Australia) 17, 25, 27 (January 1958) A Danish engineer has developed a method that uses cold processing to extract the oil from industrial herring and other fish. The manufacturing process is very simple, and it is claimed that the herring oil produced is colorless. With the help of enzymes, the fish is liquified by cold processing and the oil separated by centrifuging. The first machine installed by a Danish firm manufactures both oil and de-oiled liquid herring. The de-oiled product has unusual keeping qualities, and the method indicates the possibility of almost unlimited preservation of ground raw material. These are the products produced experimentally by the new process to date: (1) de-oiled herring pulp, (2) herring oil, (3) spray-dried herring pulp, (4) a fodder supplement, and (5) spray-dried cod fillet powder. Procedure.--The fish are transformed into fish pulp by chopping and mixing with certain enzyme cultures extracted from bacteria and fortified by more enzymes. Two methods are used because two types of culture are provided: (1) With the use of one type of culture with lean fish, the admixture can be acidulated to a pH making it adequate for storage as desired. The pulp is a highly valuable fodder supplement. (2) With the use of the second type of enzyme with fat fish, the admixture can be centrifuged into oil and pulp at a temperature not exceeding 122° F. The de-oiled fish pulp can be either acidulated, as under (1) for use as a fodder supplement, or spray-dried into almost nonperishable fish powder with all the nutritive value of the fresh fish. (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XI, NO. 6 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE	6. 54 THE STURGEON Gordon, Bernard L. Maine Coast Fisherman 12, 10 (March 1958) Approximately 15 species of sturgeon are found in waters of the Northern Hemisphere. The prevalent species on the East Coast of the United States from the St. Lawrence river to the Gulf of Mexico is <i>Acipenser sturio</i>, or the common sturgeon. <i>Acipenser brevirostris</i>, the short-nosed sturgeon, found from Provincetown, Massachusetts, to Charleston, South Carolina, is smaller in size and less abundant than the common sturgeon. Sturgeon are found in both salt and fresh water. They enter coastal rivers in the late spring to spawn. A mature female sturgeon may produce as many as two or three million eggs at one breeding period. The ripe eggs are almost black, and are enclosed in a gelatinous material. Caviar.--In the form of caviar, the roe from ripe sturgeon are relished by gourmets around the world. In the preparation of caviar, the fresh roe are placed on a small-mesh screen. The eggs are rubbed gently against the screen to separate them from the enveloping membrane. The separated eggs are washed either in vinegar or in white wine and then are spread out and rubbed with fine quality salt. Although the salt causes the eggs to become dry at first, within 10 to 15 minutes liquid is drawn from the eggs by osmotic action, and a brine is formed. The salted eggs are then drained in a fine-mesh sieve and packed into oak kegs to be marketed. Most of the caviar served in American restaurants is from the Caspian Sea region of Russia. Three sizes of Russian caviar are marketed: (1) <i>Beluga</i>, the largest and best quality, comes from fish that weigh a ton or more; (2) <i>Ossetra</i>, a medium-size caviar, comes from sturgeon weighing (over) COMMERCIAL FISHERIES ABSTRACTS VOL. XI, NO. 6 PAGE 15 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

6. 130

The following advantages are claimed: (1) Even big quantities of fresh fish can be treated immediately after landing, any spoilage of raw material thereby being precluded. The process, being short and simple, demands only very simple machinery and allows storage of the semi-processed product for later successive processing into final products. (2) The fish oil is centrifuged from fat fish under temperatures so low that the original characteristics of the fish remain intact. (3) The proteins of the fish are hydrolyzed into free amino acids, which are easily absorbed by humans and animals. Both the pulp and the fish powder have long-keeping qualities and are rich in proteins.

6. 54 (Cross Reference: 1. 9)

about 300 pounds; and (3) "sevruga," the smallest size, comes from fish weighing less than 150 pounds. The caviar of best quality is made during the winter.

Isinglass. -- Another interesting product of sturgeon is isinglass. This material is obtained from the air bladder or sounds of the sturgeon. The transparent plastic-like material formerly was used in a variety of ways, but today its most important use is in the clarification of wines. One ounce of isinglass can be used to clarify 200 to 300 gallons of wine in 8 to 10 days.

4. 7

6. 3

a marketable size in a shorter growing period than pigs that did not receive seaweed meal. Laying hens that received 5 percent seaweed meal in their diets produced a larger quantity of grade A-1 eggs than did hens that did not receive seaweed meal. Seaweed meal as a supplement in the diet of turkeys reduced mortality to zero according to a British Columbia Turkey Producers' association report. Favorable reports also have been received from fur farmers and from salmon and trout hatcheries.

DETERMINATION OF PROTEIN CONTENT OF FISH FROM THEIR ALBUMINOID AMMONIA

Mites, S. N.

Journal of the Scientific and Industrial Research 15, No. 4, Section C, p. 100 (April 1958) (India)
World Fisheries Abstracts 9, 45-46 (January-February 1958)

The figures for albuminoid nitrogen (AAN) could be of value in the examination of vinegars, soft drinks, jams, milk, and milk products, cereals, etc. This determination could also be used in the analysis of fish, for example, to determine the protein content of fish. It provides an alternative to the usual Kjeldahl method for the determination of nitrogen in fish.

Procedure.--Weigh 2 g. of the well mixed, pressed fish (edible portion) into a 250 ml. beaker, add 50 ml. of distilled water followed by 20 ml. of 30% NaOH solution and heat on a boiling water bath with occasional stirring, for about 1 hr. In this time, the sample should go into solution. Transfer the alkaline solution, with the aid of hot water, into a 500 ml. volumetric flask and, cooling, make up to mark with water. Pipette a 5 ml. aliquot of the solution into a distillation flask, add 245 solid $KMnO_4$ along with the 50 ml. of the alkaline permanganate reagent for the second distillation. Neutralize the ammonia obtained in the second distillation and match with standard ammonium chloride solution. In the present study the matching was done in an 'EEL' absorptiometer.

The results given in Table 1 (see over) show that there exists a close relation between the values for total and albuminoid nitrogen.

Comparative figures for total proteins as determined from total nitrogen (TN) by the usual Kjeldahl method and as calculated from the AAN values are shown in Table 2 (see over). The agreement is sufficiently satisfactory.

See tables, over.

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Reprinted in whole

THE EXPRESSIBLE FLUID OF FISH FILLETS. VI. ELECTROPHORETIC ANALYSIS OF THE EXPRESSIBLE FLUID OF COD MUSCLE

Connell, J. J.

Journal of the Science of Food and Agriculture 9, 701-706 (December 1957)

Previous papers have described the preparation and nature of the fluid that can be expressed from fresh, iced, or frozen cod muscle. A conclusion had been drawn that the expressible fluid obtained from iced fish came largely from the intercellular fluid. Freezing usually damages the cells, so that intracellular components, such as deoxyribonucleic acid, are observed in the expressible fluid. This paper is concerned with the electrophoretic separation of other components from the expressible fluid of unfrozen cod--the fluid being obtained by pressure.

Experimental.--Two types of expressible fluid were used: (a) obtained by Banks' method from fillets cut from 1 to 4 day iced cod and (b) from coarsely minced cod muscle in a hydraulic press at 10 tons per sq. in. With the latter method, the yield of fluid was about 10 grams per 100 grams of muscle with protein content of the fluid about 6 percent. Electrophoretic analyses were performed according to Connell (1953), all analyses being done in a phosphate buffer of ionic strength 0.05 and pH 7.4.

Results.--Thirteen electrophoretic diagrams are shown. In those from hydraulically pressed fluid, there appears a large increase in area in the region of component 3 over the area shown by other methods. This peak (EPF) normally contributes about a third of the area of the diagram for expressible fluid from iced fish but up to 80 percent in expressible fluid from frozen or thawed fish. As to the nature of this protein--investigations of other researchers are detailed, and by a process of elimination, component EF remains unidentified.

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ABSTRACTER: Joseph C. Blucher

PROTEIN DETERMINATION

EXPRESSIBLE FLUID OF COD

PURIFIED SHELLFISH POISON FOR BIOASSAY STANDARDIZATION

Schantz, E. J., McFarren, E. F., Schafer, M. L., and Lewis, K. H. (U. S. Public Health Service, Cincinnati, Ohio)

Journal of the Association of Official Agricultural Chemists 41, 180-188 (February 1958)

The authors developed a procedure for the bioassay of paralytic shellfish poison. This procedure utilizes a purified poison as a reference standard. Seven different laboratories that have used the purified poison and the procedures outlined in this paper have reported conversion factors that range from 0.154 to 0.250 micrograms of poison per mouse unit. These values can be grouped as follows: (1) 0.154 micrograms, (2) 0.185 to 0.206 micrograms, and (3) 0.164 to 0.183 micrograms. These groups have been shown to differ significantly from each other. As a consequence, a need exists also standardizing the bioassay method with the aid of the purified reference standard. The results also indicate that significant differences may exist because of the strain of mice used or because of uncontrolled environmental conditions.

Findings in the determination of the conversion factor value and in the bioassay of an acid extract of clams, the authors recommended the following: (1) A relationship between mouse units and median death time can be used usually at all pH values; (2) the pH of the solution injected into the mice should range between pH 2 to 4; (3) dilutions should be made to achieve a median death time range of 5 to 7 minutes; (4) the weight range of the mice used should be from 19 to 21 grams and not more than 23 grams; (5) ten mice should be used with dilution used to determine the conversion factor value; and (6) the injection of 3 mice is sufficient for routine assays provided the median death time range is from 5 to 7 minutes.

Conclusions.--Recovery studies indicate that in the assay of low toxicity clams, which contain approximately 400 mouse units per 100 grams, the bioassay may underestimate existing toxicity by as much as 60 percent. A 60 to 70 percent reduction of the bioassay value also was observed when

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ABSTRACTER: Martin Heerdt

DEVELOPMENT OF OBJECTIVE TESTS FOR QUALITY OF FRESH, FROZEN, AND PROCESSED FISH

Plakur, Frank T. (Bureau of Commercial Fisheries, East Boston, Massachusetts)
Commercial Fisheries Review 20, 20-22 (January 1958)

Suitable chemical or physical tests for determining the quality of fresh and frozen raw fishery products would directly indicate the quality level of the product at the time tested and possibly provide a means of estimating its keeping quality during subsequent iced or frozen storage. For such tests to be practical, they must be reliable, simple, rapid, and relatively inexpensive.

The primary and most important value of such a test would lie in its use as an aid to marketing throughout the distribution chain. The buyer and seller would know exactly the quality of the product involved in each transaction. Specific methods of application would include: (1) evaluation of the quality of fish landed at the dock (this would serve as a basis for sales between fishermen and packers); (2) evaluation of the quality of the manufactured or processed product (this would serve as a basis for sales between packer and broker, and it would also provide a basis for determining of quality in market and storage time for the particular product); and (3) objective measurement of quality (this would provide a legal basis in any court action and in State and Federal inspection and standardization programs as a part of the distribution chain).

In 1955, a contract was awarded to the Massachusetts Institute of Technology (MIT) by the U.S. Fish and Wildlife Service to study the problem of protein degradation in water as the major component of most fishery products. The pattern for the spoilage of fish is closely related to the production of degradation products from the protein fraction of fish. The MIT researchers therefore decided to investigate the degradation products of fish protein as a means of developing an objective test for the quality of the fish.

Another angle--the physical change--was also considered by the researchers. When degradation of protein occurs, certain changes also develop in the physical condition of the fish. These

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ABSTRACTER: Kathryn L. Otterhaug

BIOASSAY OF SHELLFISH POISON

OBJECTIVE TEST FOR FRESHNESS

Discussion.—Much is known of the nature of expressible fluids from animal muscle and the sources of their components. Component EF is not tropomyosin, actin, or serum albumin and probably is not Perry's pseudoglobulin. It may possibly be located in the intercellular fluid, the sarcoplasm, or the fibrils. The author, by a process of elimination, favors the fibrils as its source. Attempts to show such a location, however, have been unsuccessful.

"The nature and origin of component EF therefore remain obscure, and the failure to gain more positive evidence is largely due to the inability to secure from cod muscle what is unequivocally intercellular fluid."

Table 1.—Relation between total and albuminoid nitrogen in fish

Type of fish	Range of AAN %	Range of TN %	TN/AAN	Mean value of TN/AAN
Labeo rohita, Lates calcarifer, prawn, shrimp, Puntius sarana, silver pomfret, Clarias batrachus, etc. (40 samples)	1.23 to 2.57	2.45 to 5.18	2.00 to 2.14	2.06

Table 2.—Protein values calculated from AAN and TN values

Type of fish	TN × 6.25 %	Total protein AAN × 2.06 × 6.25 %
Labeo rohita (rohu) No. 1	21.80	21.57
No. 2	21.58	21.58
Lates calcarifer (beeti) No. 1	20.09	19.96
No. 2	17.59	17.39
Peneaus carinatus (prawn) No. 1	20.25	20.60
No. 2	20.74	20.80
Metapeneus monoceros (shrimp) No. 1	15.62	15.77
Puntius sarana (punti) No. 1	18.64	18.64
Chondroplites chinensis (silver pomfret)	26.20	26.10

include (1) softening or development of stringiness of the meat, (2) clouding of the eyes, and (3) dulling of the color when the meat is exposed to air. Development of a physical objective test would involve (a) classifying the physical changes that take place, (b) developing a method to evaluate or record progressive changes in the physical characteristics, and (c) relating these changes to the progressive change in quality of the fishery product.

Degradation products of fish protein and compounds involved in biochemical reactions that were tested included piperidine, histamine, trimethylamine, creatinine, carbonyls, and amino acids. One or more tests were developed and applied to measure the amount of each of these products in the fish or meat. Biochemical tests included measurement of the oxidation-reduction electrical potential of the fish meat and of the rheological (rheology is the science of flow dealing with the deformation of matter under certain specific conditions of stress) response of the tissue. Physical tests included studies on changes in the tenderness of the meat and in the viscosity and refractive index (light-bending properties) of the eye fluids of fish as spoilage progressed.

Of all the chemical, biochemical, and physical tests tried, only one showed real promise. This was the physical test based on the refractive index of the eye fluids of the fish (haddock). Visual observations of the eye fluids of the fish revealed that they were crystal clear during the first few days the fish were held in ice. During continued storage the eye fluids became yellow and the intensity of the color increased with storage. After a certain point in storage, blood was liberated in the eye fluids and the yellow color was masked with red. Although the changes in the eye fluids can be observed visually, this method does not provide a reliable basis of measuring and standardizing the changes that take place. A mechanical means of measuring such changes is necessary.

The refractive index is a relatively simple test for a trained technician. Qualified laymen can readily be trained within a short period. The test is conducted as follows: (1) The fluid of the eyes of several fish is collected. (2) The fluid is transferred to a centrifuge to clarify the mixture and then is filtered to remove and discard a gel-like component. (3) Two to three drops of the clarified eye fluid is used to measure the refractive index in an Abbe refractometer.

A typical "refractive index-storage time of fish" relationship was found for haddock stored in ice aboard a fishing vessel.

the ash from an equivalent amount of an acid extract of clams or 0.5 percent sodium chloride was added to a solution of purified poison. The effects of sodium chloride, at least in part, are responsible for the poor recovery in the bioassay of low toxicity clams.

Table 1.—Determination of CF value (factor for conversion of mouse units to micrograms of poison)

ML stock soln. (1 mmg./ml.)	ML water mmg./ml.	Ref. standard, mmg./ml.	Median death time in min. and sec.	Mouse units per ml. (from Sommer's table)	CF value (mmg. per mouse unit)
10	24	0.294	5:23	1.78	0.165
10	24	0.294	6:24	1.53	0.182
10	25	0.286	6:37	1.46	0.196
10	25	0.286	5:16	1.63	0.166
10	25	0.286	6:50	1.42	0.201
10	25	0.286	5:27	1.74	0.164
10	25	0.286	5:03	1.80	0.179
10	26	0.278	5:52	1.54	0.170
10	26	0.278	5:07	1.84	0.224

CF value = 0.183 mmg. per mouse unit $\pm$ 0.022 (or 12%). Standard error of mean

= 0.022 = 0.007

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8.0 MOLLUSKS -- CHEMICAL COMPOSITION

Frags, F. Investigaciones Pesqueras 4, 109 (April 1956) (Barcelona, Spain) World Fisheries Abstracts 3, 47-48 (September-October 1957)

In addition to the amount of food (plankton) available, mussel growth depends upon the temperature of the sea water, the salinity, the ocean currents, etc. These factors are so favorable in the Vigo area (N. Spain) that mussels grow for 8 months in the year, while in the Netherlands, their growing period is limited to 4 months. Because of this the number of floating shellfish culturing installations where the small mussels are hung from ropes until they reach a commercial size is increasing in the Vigo region. Wild mussels are also used. The author studies both types of mollusks (wild and cultured) and determines their chemical composition using samples taken every 15 days during a year and classifies them into 3 different sizes according to the size of the shell 40 to 45, 50 to 60, and 70 to 75 mm. (1-19/32 to 1-25/32, 1-31/32 to 2-3/8, 2-3/4 to 2-31/32 in.). The conditions of the initial draining are very important in the final results of the analysis. When this is insufficient, wrong values are obtained because of the salt water. On the other hand, when the draining is excessive, some proteins are lost according to the analyzer. The ratio between the weight and the chemical constituents is very important for industrial purposes or for a systematic study of shellfish population, since knowing only the fresh weight of the mollusk and the proportion of water it is possible to calculate by mathematical equations the amounts of glycogen, fat, proteins, etc. When determining the chemical composition of cultured mussels that have grown on the same rope at depths of 1.5, 2.5, 3.0, and 3.5 m. (4, 8, 2, 8 and 11.5 ft.) it was found that the proportions of water and ash decrease with the depth, while those of glycogen and fat increase. In the mussel that grows spontaneously, there is a correlation between the weight of the mollusk, the production of plankton and the temperature (both determined daily). This is not very noticeable in mussels cultured in floating installations. In spite of the checks made using pure substances, it was found in some of the samples that the addition of the

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COMMERCIAL FISHERIES ABSTRACTS VOL. XI, NO. 6 PAGE 19
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: F. Lopez-Capont

8.42 SODIUM AND POTASSIUM IN THE EDIBLE PORTIONS OF 34 SPECIES OF FISH

Thurston, Claude E. (Bureau of Commercial Fisheries, Fishery Technological Laboratory, Seattle, Washington) Commercial Fisheries Review 20, 1-5 (January 1958) Journal of the American Dietetic Association 34, 386-399 (April 1958)

Doctors, in treating such disorders as inadequate protein digestion and congestive heart failure with its attendant edema, are placing increased emphasis on rigid control of the sodium content of the patient's diet. This includes using unsalted foods and avoiding those that have a high natural content of sodium. The maximum content of sodium specified by nutritionists for low-sodium diets is 100 milligrams per 100 grams of meat. The values for many animal and vegetable products have been determined, but information available on fish is very limited. The objective of the present work was to determine the content of sodium in as wide a variety as possible of the principal species of fresh-water and salt-water fish. Potassium values were included for comparative purposes because considerable attention now is being directed to the sodium-potassium balance.

The specimens used in this study included 28 salt-water species from the Atlantic and Pacific Oceans and 6 fresh-water species from lakes and rivers. The samples were homogenized by a grinder and were sealed, and the ash was analyzed quantitatively for sodium and potassium by a direct-reading flame photometer.

The ratio of the content of sodium to that of potassium was 0.213 for salt-water fish and 0.199 for fresh-water fish--or approximately one part by weight of sodium to five parts by weight of potassium for both salt-water and fresh-water fish.

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UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: Kathryn L. Osterhaug

COMPOSITION OF MUSSELS

SODIUM CONTENT OF FISH

8.610

VITAMIN A₁ ALDEHYDE IN FISH EGGS

Plack, P. A.; Thompson, S. Y.; and Kon, S. K. (University of Reading, Reading, England) The Biochemical Journal 65, 4p (January 1956)

In previous studies, the authors reported that vitamin A activity in herring eggs was 7 to 10 times greater when measured biologically than when measured chemically. These measurements were made from the oil had been extracted and saponified. Vitamin A₁ activity could not be detected in lipid extracts prepared from the eggs. The authors were able to extract 80 to 70 percent of the biologically active vitamin A in herring eggs by modifying their ethanol-light petroleum solvent extraction technique.

Identification of vitamin A₁.--Chromatography of these ethanol-light petroleum extracts on water-weakened alumina yielded all-trans vitamin A₁ aldehyde. This aldehyde was identified by mixed chromatography analysis by its characteristic Carr-Price reaction, by its absorption curve, and by its reduction to all-trans vitamin A₁ alcohol and a conversion of this product to anhydrovitamin A₁. Lipid extracts from herring eggs contained 2 to 4 µg. of vitamin A per gram as the aldehyde and a total of 0.4 to 0.9 µg. per gram as vitamin A alcohol and ester in about equal proportions. The biological activity of these extracts from herring eggs may be accounted for by the various forms of vitamin A that they contain.

In a previous study, vitamin A activity was found to be water soluble and associated initially with a protein. Extraction with ethanol and light petroleum breaks down this protein complex and leaves the vitamin A₁ aldehyde attached to a lipid. This lipid attachment was demonstrated as follows: (1) Chromatography on ethanol-weakened alumina and elution with 2 percent volume for volume acetone in n-hexane yielded free aldehyde that was only a small part of the total aldehyde, (2) Additional free aldehyde could be obtained by shaking the extract with water, with aqueous ethanol, or by

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ABSTRACTER: Martin Heerd

9.15 VARIATION IN THE INCIDENCE OF LARVAL NEMATODES IN ATLANTIC COD FILLETS ALONG THE SOUTHERN CANADIAN MAINLAND

Scott, D. M. and Martin, W. R. (Fisheries Biological Station, St. Andrews, New Brunswick) Journal of the Fisheries Research Board of Canada 14, 975-986 (November 1957)

Experimental.-- Fillets from three sized groups of Atlantic cod (*Gadus callarias*) were analyzed for the incidence of the larval nematode (*Parascaris decipiens*). The three sized groups were scrod cod, market cod, and steak cod. This analysis is based on 13,000 fillets from cod taken during the years 1946 to 1956 from 30 areas off the southern Canadian mainland.

Findings.-- In all three sized groups of cod, the number of fillets infected with nematodes varied considerably, according to geographical location. The incidence of nematodes ranged from a low of 6 percent in market cod from the offshore Nova Scotia banks to a high of 35 to 91 percent in market cod from the southwestern Gulf of St. Lawrence. Market cod from the inshore fisheries of western Nova Scotia and Cape Breton Island showed intermediate values 14 to 22 percent larval nematodes. Similar ranges of values and geographical variations were found in scrod cod and steak cod. These geographical differences were mainly related to the distribution of the harbor seal (*Phoca vitulina*), the harp seal (*Phoca groenlandica*), and the gray seal (*Halichoerus grypus*).

The incidence of infection and the number of nematodes per fillet usually were related directly to the size of the cod. The number of nematodes per pound of fillets usually was related inversely to the size of the cod. The authors concluded that cod could become infected throughout their life and that the highest rate of infection occurred in small cod.

Local variations that were distinct from the broad geographical variations appeared in the areas

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UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: Martin Heerd

VITAMIN A₁ IN FISH EGGS

NEMATODES IN ATLANTIC COD

8. 42

Large differences were noted in the sodium values for similar species from various geographical areas.

Albacore tuna and Lake Huron lake herring had the lowest content of sodium of the 34 species analyzed.

The sodium contents of the individual species of salt-water fish ranged from 34 to 96 milligrams per 100 grams of fish and averaged 68 milligrams. The sodium content of the individual species of fresh-water fish ranged from 38 to 84 milligrams per 100 grams of fish and averaged 56 milligrams. Even the highest of the individual values for the salt-water fish lie within the limit approved by the dietetic experts, who have found that a low-sodium diet should contain less than 100 milligrams per 100 grams of food. The species of fish reported here, owing to their great diversity of flavor and texture, thus may serve as an excellent food for those restricted to monotonous low-salt diets.

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of Lockeport, Cape Breton Island, and the southwestern Gulf of St. Lawrence. In these areas, the cod taken nearest to the shore usually were the most heavily infected with nematodes.

Seasonal variations in the incidence of nematode infection appeared in the Cape Breton and Lockeport fisheries. The highest incidences of infection occurred in the spring and fall in Cape Breton cod and in the summer in Lockeport cod. The variation in the incidence of infection in the Cape Breton fisheries was attributed to seasonal migration of the cod in this fishery. An increased exploitation of shallow inshore waters during the summer accounted for the higher summer incidences of nematodes at Lockeport.

Annual fluctuations in the number of nematodes was large in all areas. In the southwestern Gulf of St. Lawrence, the incidence of nematode infection fell from 91 percent in 1946 to 35 percent in 1956. These findings appear to be related to extensive contemporary changes in the cod fishery in the Gulf of St. Lawrence.

8. 1

percentages of the various components determined by analysis was only about 98%. To explain this difference, it is stated that the factor 6.25 used commonly to convert N into protein is too low in the case of the mussel and should be increased to 7.0.

Yearly chemical composition of 55 to 60 mm. (2-5/32 to 2-3/8 in.) mussels throughout the year

Composition	Values	Wild mussel		Cultured mussel	
		Maximum	Minimum	8. 10 (Sept. - Oct.)	6. 08 (Sept.)
Weight (g.)				3. 55 (Feb.)	3. 55 (Jan. - Feb.)
Water (%)	Maximum			85. 50 (March)	85. 20 (Jan.)
	Yearly average			81. 12	81. 62
	Minimum			74. 10 (Oct.)	73. 50 (Sept.)
Protein (%)	Maximum			13. 40 (Sept.)	12. 40 (Sept.)
	Yearly average			10. 88	10. 84
	Minimum			9. 30 (March)	8. 70 (Jan.)
Glycogen (%)	Maximum			7. 63 (Oct.)	5. 25 (Sept.)
	Yearly average			2. 82 (Feb.)	2. 39
	Minimum			0. 22 (Feb.)	0. 11 (Feb.)
Ash (%)	Maximum			2. 36 (Sept. - Oct.)	2. 75 (Jan.)
	Yearly average			1. 57	2. 37
	Minimum			0. 86 (Feb.)	1. 83 (Sept.)
Fat (%)	Maximum			2. 38 (Sept. - Oct.)	1. 75 (Sept.)
	Yearly average			1. 27	1. 40
	Minimum			0. 86 (Feb.)	0. 82

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chromatography on water-weakened alumina. (3) The biological activity of this extract was reduced in acetone solution, whereas the biological activity of free vitamin A₁ aldehyde was not affected.

According to the authors, vitamin A₁ aldehyde also occurs in combination with lipid in the eggs of cod, haddock, and whiting. This appears to be the first reported occurrence of vitamin A₁ aldehyde in tissues other than the eye.

0.321	ON THE STREAMING BIREFRIGENCE OF THE AQUEOUS EXTRACTS OF SQUID MUSCLE FRACTIONATION OF THE DISSOLVED PROTEINS BY DIALYSIS Matsumoto, Juichiro J. (Tokai Regional Fisheries Research Laboratory) Bulletin of the Japanese Society of Scientific Fisheries 23, No. 1, 47-52 (1957) Both myosin-like protein and actomyosin-like protein may be present in the extract of squid and may be responsible for streaming birefringence.	0.38	EFFECTS OF METAL IONS ON THE GLYCYLGLYCINE DIPEPTIDASE Togawara, Yoshihisa and Katsumata, Teizo Bulletin of the Japanese Society of Scientific Fisheries 23, No. 2, 105-114; No. 3, 157-165 (1957) (English abstract, figures, and tables) III. On the active group of the glycylglycine dipeptidase. IV. On the interaction between sulphydryl compounds and metal ions, especially Co^{++} , Mn^{++} and Mg^{++} . V. Isolation and purification of the glycylglycine dipeptidase (1). VI. Isolation and purification of the glycylglycine dipeptidase (2).
0.321	CRYSTALLINE PROTEINS FROM THE MYOGENS OF THE CARP AND AND THE FLOUNDER Henrotte, J. G. and Dresse, F. (Univ. Liege, Belg.) Congr. intern. biochim., Resumes commun., 3 ^e Congr., Brussels 81-2 (1955) Chemical Abstracts 51, 7475 (May 25, 1957) Properties of the carp protein (cf. C. A. 49, 10239; 50, 5788) are considered. The same method of isolation and crystn. was applied to the flounder. The albumin fraction ppig. at 40 to 55% sat'd, $(\text{NH}_4)_2\text{SO}_4$ was nearly homogeneous in electrophoresis and centrifugation. When dissolved in a min. amt. of water and adjusted to pH 6.5, it rapidly crystd. (like the carp protein). Its electrophoretic properties were the same as those of carp myogen. However, its corrected const. of sedimentation S_{20} was 7.3×10^{-13} .	0.38	THE SPECIFICITY OF LIPOIDASE-LIKE ENZYME IN MACKEREL LIVER Shimizu, Chiaki and Fukuhara, Tadamobu Bulletin of the Japanese Society of Scientific Fisheries 23, No. 3, 174-176 (1957) (English abstract and figures) The mackerel liver enzyme resembles soybean lipoxidase in that it exhibits optimal activity at pH 6.8 to 7.0. The optimum temperature for the liver enzyme, however, does not coincide with that of soybean lipoxidase. It is not possible to certify that the mackerel liver enzyme is the same as the soybean lipoxidase.
0.33	THE DIRECT EFFECT OF X-RAYS ON PROTEINS Dose, Klaus Strahlentherapie 102, 522-5 (1957) Chemical Abstracts 51, 15025 (November 25, 1957) The primary effect of an X-ray dose of from 2 to 30 million r. on crystal. lysozyme was investigated. Irradiation produces a no. of closely related, but less basic proteins of different mol. wt., whose amino-acid components are partly transformed into other compds.	0.5	STUDY OF THE AEROBIC HETEROTROPHIC BACTERIA IN THE ROE OF EUROPEAN HAKE (<u>MERLUCCIIUS MERLUCCIIUS</u> L.) Redel, E. De Santiago and Berlange, E. Lobillo An. Bromatol., 8, 479-481 (1956) Food Science Abstracts 29, 427 (October 1957) Species of Flavobacterium, Pseudomonas, Micrococcus, Corynebacterium, Escherichia, and Aerobacter were isolated from hake roe. The following were identified: Achromobacter liquefaciens, Micrococcus candidus, Micrococcus conglomeratus, Escherichia intermedium, and Aerobacter cloacae.
0.33	MECHANISM OF BROWNING OF ASCORBIC ACID-CITRIC ACID-GLYCINE SYSTEMS Lailakainen, Toni; Joslyn, M. A.; and Chichester, C. O. (Department of Food Technology, University of California, Davis and Berkeley) Journal of Agricultural and Food Chemistry 5, 135-139 (February 1958) To determine whether Strecker degradation of amino acids occurred in the browning of orange juice, the browning of ascorbic acid in citrate-buffered solutions containing radioactive glycine was studied. Neither Schiff bases nor volatile aldehydes were detected. Less than 3% of the carbon dioxide evolved was derived from glycine-C1, less than 0.1% from glycine-C2. The data indicated that the Strecker degradation does not occur, in detectable degree, under the test conditions. The browning of this system, therefore, does not follow the usual pathways reported for the glucose-glycine system.	0.5	BACTERIAL FISHINESS IN MILK Corfield, E. Anne Dairy Inds., 20, 1035-7 (1955) Chemical Abstracts 51, 16996 (November 10, 1957) A Pseudomonas capable of producing a distinct bloater-like taint in milk, lecithin, choline, and betaine soins, is discussed. 0.5 THE EFFECT OF MAGNESIUM, POTASSIUM, AND IRON ON THE GROWTH AND MORPHOLOGY OF RED HALOPHILIC BACTERIA Brown, H. J. and Gibbons, N. E. Canad. J. Microbiol., 1, 486-494 (1955) Food Science Abstracts 29, 312 (November-December 1957)

3. 2344 PERFORMANCE OF FREEZERS AND COLD STORES Anonymous Report of the Food Investigation Board (Great Britain) for 1956, p. 15 (1957) Systematic tests have been initiated to facilitate the rational design of plate freezing for quick freezing plants. The effect of heat transfer conditions (1) on the time required to freeze fish in various shapes, sizes, and types of packaging materials, (2) on refrigeration pressure drops, and (3) on temperature gradients will be studied.	3. 19 FOOD IRRADIATION MAKES STRIDES Denald, George E. (Nuclear Engineer, Quartermaster Food & Container Institute for the Armed Forces, Chicago, Illinois) Food Engineering <u>29</u>, 57-59 (December 1957) More than 100 irradiated food items have been cleared for testing at the Quartermaster laboratory. Human volunteers have lived for months on full diets of irradiated foods, but the plant-processing hurdles remain unsolved. The status of various foods under test is presented in detail.
3. 2344 FREEZER DEVELOPMENT Anonymous Report of the Food Investigation Board (Great Britain) for 1956, p.15 (1957) Vertical-plate freezing of herring, white fish fillets, and small white fish would reduce labor costs and cold storage space requirements. A freezer of a type that would produce 2-inch-thick blocks was used initially during the year to begin a series of studies with these products. Methods of refrigerant control are being tried in vertical-plate freezers on board the Sir William Hardy that differ in principal from the refrigerant control methods used in vertical-plate freezers on board the Northern Wave.	3. 19 EFFECTS OF RADIATION ON HEMATIN COMPOUNDS Tappel, A. L. (University of California, Davis) Food Research <u>23</u>, 205-212 (March-April 1958) A survey was made of the effects of gamma radiation on a number of hematin compounds, including hemoglobin derivatives, hemoglobin derivatives, denatured globin hemichromes and cytochrome c. Further evidence was obtained for the anaerobic conversion of methemoglobin to oxyhemoglobin by ionizing radiation. Conditions for maximum production of a 608 mμ chromophore in irradiated cytochrome c were determined. This 608 mμ chromophore is a result of the oxidation of the porphyrin ring in cytochrome c.
3. 17 FRESH FISH 3. CHILLED STORAGE OF HAKE Cooper, C. E. B. and Rousseau, C. E. Annual Report, Fishing Industry Research Institute, Cape Town, South Africa <u>9</u>, 8-9 (1955-1956) (Abstract of this article appears under 2.40 page 5 - May 1958)	3. 235 PROCESSING OF FISH Herald, Daniel J. (Lowell, Massachusetts) U. S. Patent 2,787,549, 3 pp. (April 2, 1957) Headed, gutted, and fanned fish are heated at a temperature of from 180° to 240° F. to loosen the skin. The heating time is about 10 seconds for scaled small fish and about 45 seconds for fish that weigh about 20 ounces. A high-pressure fluid stream is impinged on the side of the fish at an angle within the range of 30° to 50° with respect to the longitudinal axis of the fish to roll back the skin. The fish is cooked sufficiently to loosen the flesh of the fish from the bones.
3. 17 EVALUATION OF CHLORPACTIN WCS-50 AS A BACTERICIDAL WASH FOR CRAB AND OYSTER MEATS Benarde, M. A. App. Microbiol. <u>5</u>, 137-140 (1957) Food Science Abstracts <u>29</u>, 428 (October 1957) Substantial reductions in the bacterial population of shelled oysters were obtained by immersing them in a solution containing 0.56% of the germicide Chlorpactin WCS-50 (active agent hypochlorous acid). No off-odors or off-flavors were discernible 12 hours after treatment. The germicide was found to be unsuitable for use with crab meat, to which it imparted an odor of chlorine and a bitter flavor that was still marked after 5 days.	3. 235 FROZEN CRAB CAKE--CAUTION Anonymous Journal of Milk and Food Technology, pp. 307-311 (November 1957) Food Engineering <u>30</u>, 125 (February 1958) Two methods of heating precooked frozen crab cakes were investigated. Cakes heated by method 1 were placed in a cold oven at the time the oven was lighted, whereas cakes heated by method 2 were placed in an oven that was preheated to a specified temperature. Cakes placed in the cold oven did not reach a center temperature adequate to kill pathogenic bacteria. The holding time in the preheated oven was barely adequate.

3. 338	BETTER WAY TO MEASURE CAN VACUUM Seamun, M. L., Food Engineering <u>29</u> , 90-91 (March 1957) (Abstract of this article appears under 0.118 page 1 - June 1957)	4. 29	INCLUSION COMPOUNDS Baron, Maximo Organic Chemical Bulletin <u>29</u> , No. 3, 4 pp. (1957) (Abstract of this article appears under 0.34 page 1 - May 1958)
3. 339	TESTING CAN HEADSPACE GAS Kohn, G., Food Engineering <u>29</u> , 54-56 (April 1957) (Abstract of this article appears under 0.118 page 1 - August 1957)	4. 29	THE CONVERSION OF FATTY ACIDS INTO ALDEHYDES Nigam, S. S. and Weedon, B. C. L. (Department of Chemistry, Imperial College of Science and Technology, South Kensington, London) Journal of the Chemical Society (London) 3320-3321 (July 1957) Weygand et al. have shown that lithium aluminum hydride reduction of the N-methylamides of a wide variety of acids gives aldehydes in good yield: $R-CO_2H-R-CO-NMePH-R-CHO$ Hitherto this method has been applied only to one long-chain fatty acid, viz. palmitic. The authors have summarized the results obtained with five saturated acids ranging from stearic to lauric, and the ethylenic acids under-10, -10, -10, and the acetylenic acids under-9-yne and under-10-yne. The products were characterized as their 2,4-dinitrophenylhydrazones. The yields were uniformly good.
3. 339	CANNING OF FISH IN STAINLESS STEEL Grižova, V. S. and Šponyakovs, Z. M., Konserva, (Vostochnitsa), Primen. <u>12</u> , No. 8, 26-9 (1957) Chemical Abstracts <u>52</u> , 3191 (February 26, 1958) Several kinds of fish (some prep. in tomato sauce, in oil, and as is) were canned in stainless steel "B1-457" (as is) in tin. The products were stored for 3 to 4 years and analyzed yearly for Fe and Cr. During the storage period the Fe concn. did not change. The Cr concn. in the products stored in stainless steel was 8 to 9 times greater than that in the control and increased with the time of storage.	4. 91	SUMMARY AND COMMENTS ON FATS IN NUTRITION AND HEALTH Goldsmith, Grace A. (Tulane University, New Orleans, Louisiana) Journal of the American Oil Chemists' Society <u>34</u> , 584 (November 1957) In spite of the paucity of current knowledge, sufficient evidence exists to suggest that dietary fat and serum lipid levels may be implicated in the development of atherosclerosis and coronary heart disease and to justify intensive exploration of all facets of this and related fields.
3. 7	STUDIES ON THE COMPLETE UTILIZATION OF SQUID (OMMASTREPHES SLOANI PACIFICUS) TAKAKAWA, Etsuji, MOTOHITO, Teruhiko, TOMITA, Koji, NAGASAWA, Yoshio, TAKEUCHI, Toshio, and SUGIYAMA, Takashi Bulletin of the Faculty of Fisheries, Hokkaido University <u>1</u> , No. 2, 165-184 (August 1956) (English abstract, figures, and tables) XIII. Relation between the freshness of raw squid and the quality of the merchandise of the dried squid. XIV. Relation between the water content of squid meat and putrefaction during the drying of squid.	4. 91	PREVALENCE OF ATHEROMA Holman, Russell L.; McGill, Henry C., Jr.; Strong, Jack P.; and Geor, Jack C. (Louisiana State University, New Orleans, Louisiana) Journal of the American Oil Chemists' Society <u>34</u> , 583 (November 1957) If diet plays a role in atherogenesis--and there is ample evidence that it does--it does so not by flooding the filtering capacity of the arterial wall with cholesterol, chylomicrons, or lipoprotein complexes but by upsetting some of the safety valves (hormones? enzymes?) that normally protect the arterial wall.
3. 7	"IONIC BRACES" FOR ALLOWING ONE TO PREPARE DRIED FISH WITH KAMABOKO POTENCE Hirano, Hiroshi Bulletin of the Japanese Society of Scientific Fisheries <u>22</u> , No. 6, 354-357 (1956) (English synopsis) The author discusses the colloidal aspect of the loss of complete protein rehydration ability, which is ordinarily unavoidable in drying fish flesh.	4. 91	PROGRESS IN THE METABOLISM OF LIPIDES Reiser, Raymond (Department of Biochemistry and Nutrition, Texas A and M College System, College Station) Journal of the American Oil Chemists' Society <u>34</u> , 570-574 (November 1957) The author presents a mechanism for fat digestion and absorption, the mode of action of a clearing factor in the blood, and a discussion of resynthesis.
3. 7	ON THE PREPARATION OF REVERSIBLY DRIED FISH MEAT Takeki, M. and Takahashi, T., Bull. Tokai Reg. Fish. Res. Lab., Tokyo No. 14, pp. 91-97 (1956) Food Science Abstracts <u>29</u> , 124 (April 1957)		

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst	Industrial and Engineering Chemistry
Analytical Chemistry	Industrial Refrigeration
Archives of Biochemistry and Biophysics	Institutions
Biochemical Journal	Journal of Agricultural and Food Chemistry
Bulletin of the Faculty of Fisheries, Hokkaido University	Journal of Applied Chemistry
Bulletin of the Japanese Society of Scientific Fisheries	Journal of Biological Chemistry
California Fish and Game	Journal of Nutrition
Canadian Fisherman	Journal of Organic Chemistry
Canadian Journal of Chemistry	Journal of the American Chemical Society
Canadian Journal of Technology	Journal of the American Dietetic Association
Canner and Freezer	Journal of the American Oil Chemists' Society
Chemical Abstracts	Journal of the Association of Official Agricultural Chemists
Chemical and Engineering News	Journal of the Chemical Society (London)
Chemical Engineering	Journal of the Fisheries Research Board of Canada
Chemical Processing	Journal of the Science of Food and Agriculture
Chemistry and Industry	Maine Coast Fisherman
Commercial Fisheries Review	Modern Packaging
Drug and Cosmetic Industry	Modern Refrigeration
FAO Fisheries Bulletin	National Fisherman
Federation Proceedings	National Provisioner
Feed Bag	Nature
Feedstuffs	Nutrition Reviews
Fisheries Newsletter (Australia)	Pacific Fisherman
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.	Pan American Fisherman
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.	Poultry Science
Fishing Gazette	Practical Home Economics
Food Engineering	Progressive Fish-Culturist
Food Manufacture	Quick Frozen Foods
Food Packer	Refrigerating Engineering
Food Preservation Quarterly	Report of the Food Investigation Board (Great Britain)
Food Processing	Science
Food Research	Southern Fisherman
Food Science Abstracts	Trade News (Fisheries Department, Canada)
Food Technology	Western Fisheries
Frosted Food Field	World Fisheries Abstracts
Gourmet	World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above listed publications are included. Biological papers are generally omitted.

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Editorial Clerk (Typist)--Gladys K. Chandler

6, 132 FISH MEAL 8. PRESERVATION OF PRESS CAKE BY ALCOHOL Rowan, A. N. Annual Report, Fishing Industry Research Institute, Cape Town, South Africa 9, 25 (1955-1956) To preserve press cake on a journey from the factories to the laboratory, 30 and 60 percent by weight of 95 percent alcohol was added to the samples of press cake. These samples after being held for 14 days at room temperature were free from rancid and off-odors, whereas control samples that did not receive alcohol or any other preservatives were rancid, off in odor, and moldy.	6, 54 LOOK TO THE SEA Ronayne, Mark Trade News 10, 3-13 (November 1957) (Abstract of this article appears under 4, 13 page 15 - April 1958)
6, 132 FISH MEAL 9. FISH TAG RECOVERY Stander, G. H. Annual Report, Fishing Industry Research Institute, Cape Town, South Africa 9, 25-26 (1955-1956) Fish meal plants equipped with magnets located at the dry mill intake were tested for overall fish-tag recovery efficiency by dropping 20 tagged pilchards at 30 second intervals into the cooker feed-screw. Of six plants tested only two plants gave a desired overall efficiency of 75 percent or more from tagged pilchards. Poor magnet performance accounted for losses of up to 75 percent of the tags; however, in two plants only 15 percent of the tags were lost between the fish pit and the dry mill.	6, 54 DEHYDRATED FRESH FISH POWDER FOR HUMAN NUTRITION Roels, O. A. Bull. agric. Congo Belge 48, 423-438 (1957) Food Science Abstracts 25, 309 (November-December 1957) Fish offers the best opportunity for increasing the world's supply of protein, and in tropical countries it is most easily and cheaply preserved and handled in the form of a dry powder. Fish powder for human consumption is already being manufactured in the Gold Coast, South Africa, Uganda, and Chile. The United Nations Organization is supporting the establishment of new factories for fish powders intended for supplementing the diets of children. Nondodorized powder is already popular in some regions; in others, deodorized powder is preferred, and may be incorporated in bread.
6, 34 ALGINIC ACID GELS Brunel, Henri Fr. 1, 007, 767 (May 9, 1952) Chemical Abstracts 51, 12513 (August 25, 1957) Alginic acid gels for use in soap and cleaning compns. are prep'd. by mixing wet alginic acid with a powd. swelling agent or its soln., chosen from the group consisting of alkaline carbonates, neutral or acid mineral salts, and org. bases soluble in weakly alkaline solution. Water is added until a transparent mass is obtained. Swelling is speeded by heating to 50° to 60° C. Used with alkali line alkylsulfonates-sulfonates, a white, thick, foam is obtained comparable to that of the best soap.	7, 8 THE NORTHEAST REGIONAL APPROACH TO COLLABORATIVE PANEL TESTING Wiley, Robert C.; Briant, Alice M.; Fagerson, Irving S.; Murphy, Elizabeth F.; and Sabry, Jean H. Food Technology 11, 43-48 (September 1957) General objectives were (1) to develop a standard and uniform method for evaluating flavor differences and (2) to determine the effects of certain pesticides on the flavor of selected fruits and vegetables. This report deals primarily with the first objective.
6, 34 STUDIES ON SOLUBLE ALGINATES Oguro, Miki and Suzuki, Noboru Bulletin of the Faculty of Fisheries, Hokkaido University 7, No. 2, 134-146 (August 1956) (English abstract, tables, and figures) I. The viscosity of the soluble alginates including lithium alginate, sodium alginate, potassium alginate, and ammonium alginate. -- This series of reports compares the colloidal and chemical properties of various soluble alginate solutions that were made from a batch of alginic acid obtained from <u>Laminaria angustata</u>.	7, 8 SELECTION OF A TASTE PANEL FOR EVALUATING THE QUALITY OF PROCESSED MILK Kirkpatrick, Mary E.; Lamb, Jessie C.; Dawson, Elsie H.; and Eisen, Jacob N. (U. S. Department of Agriculture, Washington, D. C.) Food Technology 11, 3-8 (September 1957) Taste thresholds for tallows, proteolytic, storage, and rancid off-flavors in dry milk were determined with the assistance of 10 men and 10 women by a dilution technique. The same 20 tasters were evaluated by a ranked paired-comparison method for their ability to discriminate among evaporated milks processed (1) by high temperature sterilization and (2) by the conventional sterilization method. A panel composed of six men and a panel composed of six women were selected on the basis of these tests.

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8. 51	FISH MEAL 2. SIZE AND WATER-SOLUBLE PROTEIN CONTENT OF PILCHARDS Stander, G. H. Annual Report, Fishing Industry Research Institute, Cape Town, South Africa 9, 20 (1955-1956) This study reports further work on the relation between the size of pilchards and their water-soluble protein content. Pilchards were analyzed for water-soluble protein after 6 hours and 33 hours of storage in air at 67° to 75° F. Large pilchards showed signs of more advanced spoilage than did small pilchards. According to the data obtained, the relation between size and water soluble protein content is not consistent.
8. 51	ROCK LOBSTER 6. FRESHNESS OF ROCK LOBSTER TAIL SHELL AND CHITIN YIELDS Dreotti, G. M. and van der Merwe, R. P. Annual Report, Fishing Industry Research Institute, Cape Town, South Africa 9, 19 (1955-1956) Fresh rock-lobster tail shell from a canning factory was divided into 3 lots. Lot 1 was analyzed immediately for chitin and protein. Lots 2 and 3 were stored at 100 percent relative humidity and 70° to 76° F. in unsealed containers for 1 and 3 weeks, respectively. After 1 week, both lots had developed off-odor. Lots 2 and 3 showed on analysis a decrease in crude protein from 44.5 to 36.6 percent (dry basis) as a result of putrefaction and an increase in chitin from an initial 22.5 percent to 25.4 percent.
8. 51	CHEMICAL STUDIES ON MARINE ALGAE Takagi, Mitsuao (Hokkaido University) Bulletin of the Faculty of Fisheries, Hokkaido University 7, No. 2, 119-129 (August 1956) (in English) X. Free and combined amino acids in marine algae. -- The present paper deals with the results of experiments on free and combined amino acids occurring in 5 species of marine green algae, 11 species of marine brown algae and 16 species of marine red algae. Differences in amounts and varieties of various amino acids were observed and tabulated.
8. 51	INSULIN IN TUNA FISH, THUNNUS THYNNUS Mestres, J. Planas (Univ. Barcelona) Rev. espan. fisiol. 11, 285-95 (1955) Chemical Abstracts 51, 8023 (April 25, 1957)
8. 51	OCCURRENCE OF A SUBSTANCE P-LIKE POLYPEPTIDE IN FISH INTESTINE AND BRAIN V. Euler, U. S. and Östlund, E. (Marine Biol. Sta., Kristineberg, Swed.) Brit. J. Pharmacol. 11, 232-5 (1956) Chemical Abstracts 51, 9017 (June 25, 1957) A factor having the same qualitative and quantitative properties as substance P was found in intestine of the cod and the dogfish (4, 8 to 5.5 units/g.) and cod brain (6 units/g.).

8. 59	CRYSTALLINE WHALE PEPSIN II. SOLUBILITY CURVE, ELEMENTARY COMPOSITION, OPTIMUM pH AND STABILITY Saito, Tsuneyuki and Iihara, Yoshio Bulletin of the Faculty of Fisheries, Hokkaido University 7, No. 2, 147-158 (August 1956)
8. 59	ON TUNNY-FISH BILE (THUNNUS THYNNUS) Castella, J. and Pascual, J. Rev. Espan. fisiol. 9, 77-80 (1953) Chemical Abstracts 51, 6022 (April 25, 1957) An analysis of the Spanish tunny-fish bile, after expression from the gall bladder and preservation with 1% NaOH, showed 1.7 g. of cholesterol and 19 g. of cholic acid/l.
8. 59	CONTRIBUTIONS TO THE STUDY OF MARINE PRODUCTS XLV. SPONGE NUCLEIC ACIDS Bergmann, Werner; Watkins, Jeffrey C.; and Stempien, Martin F., Jr. The Journal of Organic Chemistry 22, 1308-1313 (November 1957) Nucleic acids have been isolated from sixteen different species of sponges, and all have been de-graded to the nucleosides. All pentose nucleic acids gave the four usual ribonucleosides, and all deoxypentose nucleic acids gave the four usual deoxyribosides. The nucleic acids of <i>Cryptothoa crypta</i> were exceptional in their extraordinarily low content of ribonucleic acid.
9. 14	THE NUTRITION OF SALMONIDS Wood, E. M.; Yasutake, W. T.; Woodall, A. N.; and Halver, J. E. (Salmon Nutrition Laboratory, Fish and Wildlife Service, Cook, Washington) Journal of Nutrition 61, 465-488 (April 10, 1957) I. Chemical and histological studies of wild and domestic fish. -- Salmonids reared under artificial conditions show marked consistent differences in body composition in comparison with wild salmonids. Diet is probably the most important single factor in producing the changes observed in body composition. II. Studies on production diets. -- In 69 production diets fed to hatchery salmonids, there was a close relation between the body composition of hatchery-raised fish and the composition of the diets fed. Wild fish had markedly different body composition characterized by a much lower level of fat and relatively higher protein and mineral content.
9. 14	NUTRITION OF SALMONOID FISHES Halver, John E. (Salmon Nutrition Laboratory, Fish and Wildlife Service, Cook, Washington) Journal of Nutrition 62, 225-254 (June 10, 1957) III. Water-soluble vitamin requirements of chinook salmon. -- Requirements for thiamine, riboflavin, pyridoxine, pantothenic acid, niacin, inositol, biotin, folic acid, and choline were demonstrated. Inconclusive results were obtained for vitamin B12-deficient fish. Under the experimental conditions used, no deficiency syndromes were observed in ascorbic acid- or para-aminobenzoic acid-deficient fish. IV. An amino acid test diet for chinook salmon. -- An amino acid test diet was formulated that would maintain chinook-salmon fingerlings for at least a 14-week growing period under the experimental conditions used. The amino acid mixture comprising the nitrogen source consisted of crystalline L-amino acids bound together with the other diet components by carboxy-methylcellulose. An amino acid mixture approximating the content of amino acids in yolk-sac fry and fingerling salmon protein failed to yield acceptable growth when compared with the above amino acid mixture or the control diet.

